Article

Society and Space

EPD: Society and Space
0(0) 1–17

DOI: 10.1177/0263775820911940
journals.sagepub.com/home/epd
SAGE

To oblivion and beyond: Imagining infrastructure after collapse

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Abstract
Theorists of infrastructure have thought a great deal about time and temporality but have not often seriously considered the future of these massive and durable objects. This elision is notable due to infrastructures' current role in our world: highly vulnerable to crises such as those brought about by climate change yet also playing a role in hastening such events. Following Lauren Berlant and Dominic Boyer, we take the current moment as an opportunity to reconsider infrastructure and to work toward a perspective that would see it as a resource from which to construct more creative and equitable futures. Here, we consider such futures through readings of Kim Stanley Robinson's Three Californias Trilogy, which imagines various sociopolitical futures for southern California. Attending to the roles that infrastructures play in shaping these futures, we argue for a perspective that sees collapse as an opening of material possibility and highlight aspects of infrastructures, such as their distribution in space that might prove meaningful in thinking about such crises and transitions.

Keywords
Infrastructure, temporality, collapse

Introduction

Los Angeles' Belmont Tunnel emerges from the ground roughly a mile from the city's downtown. Completed in 1925, the tunnel was planned to be—and for nearly 30 years was—a key segment of the city's transportation infrastructure, helping passengers

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circumvent downtown traffic as they moved between the growing suburbs and business and shopping opportunities in the city. At the tunnel's terminus in West Lake, an open railyard shuttled passengers onto lines bound for Burbank, Hollywood, Santa Monica, and the San Fernando Valley.

Thirty years later, in 1955, the last train emerged from the Belmont Tunnel, a banner draped across its front reading, "To Oblivion." Los Angeles' transition from home of the largest electric railway system in the world to a city dominated by personal vehicles and freeways was driven by either the power of motor vehicle manufacturers like General Motors and the oil industry (see Snell, 1974; a narrative also picked up by the film, *Who Framed Roger Rabbit*) or competition between geographic regions (Adler, 1991). As freeway construction commenced in the 1950s, most rail lines were replaced by buses, and the tunnel and Toluca railyard were abandoned, leaving "a hole in the ground which apparently could be used for nothing" (Pacific Electric Subway Terminal, n.d.).

The tunnel and railyard remained abandoned for the next 50 years, periodically used by the city to store impounded cars or cold war rations (Harvey, 2009). It regularly functioned for community members as a site for graffiti (Patel, 2007), raves (Khawaja, 2015), and weekend games of tarasca, an indigenous Mexican sport (Hernandez, 2004). For a time, the Belmont Tunnel was the only known tarasca ball court in the US (Knight, 2005). With these latter uses, the space was decidedly public, an argument residents made when protesting the construction of the Belmont Station apartments, completed in 2008 (Hernandez, 2004). The new owners painted over the graffiti and turned the yard in front of the now-blocked tunnel entrance into a dog park behind a locked gate.

The manager of the apartments told the *Los Angeles Times* that there had been between 100 and 200 coats of artists' paint sandblasted away during construction. "I took a little chip myself," he told the *Times*. "This is a part of history" (Harvey, 2009).

It is not difficult to imagine a study of southern California's transportation infrastructure following the pattern established by Hughes' (1983) influential *Networks of Power*. Tracing back from the private apartment complex through the hours spent by residents on congested freeways, the smog-filled air and the growth of the suburbs in Orange County, a socio-technical story can be brought out with impacts on land and bodies linked to technical constraints, societal structures and personal decisions. The tunnel's use, too, as appropriated public space hints at perspectives on infrastructure more focused on unintended use, work-arounds and the ongoing task of aligning systems with users (e.g. Amin, 2014; Graham, 2001; Larkin, 2008).

Yet, despite this clear history, we feel increasingly pulled to think about the future of infrastructures like the Belmont Tunnel and the network of tracks that spider across southern California. Considering such futures means taking seriously the prospect that infrastructures will not be maintained, that railyards will not only be converted into apartments but that they will also fall into disrepair and disuse in the wake of natural and societal disasters.

While it is difficult to imagine infrastructures' future lives, it is harder still to imagine the disappearance from the landscape of the large-scale concrete and steel structures that define much of the 20th-century. Maintenance and repair (Jackson, 2013) are central to the continued functioning of infrastructure; these social processes can easily become untenable for municipalities and states. As a 2017 report from the American Society of Civil Engineers finds, America's infrastructures are already in various states of disrepair (America's Infrastructure Grade, 2017). And, even while the world changes and deterioration continues, the scale and durability of infrastructures constructed in the 20th-century ensure that, like Roman aqueducts, these objects will persist despite disaster, disrepair and disuse.

Strikingly, we are now in a situation in which infrastructures themselves are crucially implicated in large-scale societal and environmental changes that will likely lead to the failure of maintenance processes required to perpetuate their functioning. As Boyer (2016) argues, infrastructures possess a temporal persistence that "points deathward" (p. 174). Oil refineries along the Texas Gulf Coast, for example, take part in a system of resource extraction that hastens climate change; at the same time, climate change threatens the continued functioning of these refineries, and oil companies have requested federal funds to protect their facilities from the destructive environmental phenomena that they have a hand in creating (Associated Press, 2018). As Appel et al. (2018) note, "Infrastructural breakdown saturates a particular politics of the present" (p. 3).

To Oblivion

The Belmont Tunnel is a reminder that infrastructures do not function forever, and a banner reading "To Oblivion" hints that we do not know what comes next. Here, we approach infrastructures' futures through various concepts related to optimism: what does it mean for the future to be better than the present, and what role might infrastructure play in that transition? These are especially striking questions given the material and labor investments embodied by infrastructures, as well as the societal hopes they represent and the power inequities they reveal. A non-functioning tunnel asks, "What will happen to the material and labor held here," but also, "How will we build a structurally different society?"

This tension is well represented by Berlant's (2016) discussion of cruel optimism as the experience of placing hope in an object that perpetually prevents the realization of that hope. In the context of infrastructure and collapse, cruel optimism is the belief that rebuilding is a way to heal; that patching the levee will do something other than return the same inequities that it represented before. Instead of focusing on repair, however, we focus below on the idea put forward by Berlant (2016) and Boyer (2016, 2018) that breakdown might instead represent an opportunity to create futures that do not resemble the past. This is a radically different notion than is entailed by cruel optimism's emphasis on repair, and the precise dynamics of how such a transition might occur are currently hazy. This article's contribution is in developing Berlant and Boyer's work on infrastructure in order to attend not just to the broad potential of infrastructures but more specifically to how specific infrastructures and specific capacities of infrastructures might play a role in imagining and building novel futures.

We develop this contribution through readings of Kim Stanley Robinson's Three Californias Trilogy, consisting of *The Wild Shore* (Robinson, 1984), *The Gold Coast* (Robinson, 1988), and *Pacific Edge* (Robinson, 1990). These novels imagine distinct futures for southern California and are provocative not just for the social and political worlds that they describe but also for the ways that infrastructures are instrumental in the production of these future worlds. Written during the 1980s, the novels represent distinct moments in both the history of science fiction (as Robinson has been noted as a rare utopianist during the otherwise cyberpunk-heavy period) and the history of infrastructure in California (as we see the period as a turning point from an emphasis on large-scale, hyper-visible military, nuclear and transportation projects to the less visible information communication projects that would follow). These novels allow us to envision infrastructure as both disastrous and renewing—as collapse-hastening and, potentially, collapse-healing. We suggest that Robinson's novels, together with his statements elsewhere on cruel optimism and an alternative he refers to as "angry optimism," present a coherent theory of infrastructure's role in the production of radical futures. Articulating this theory extends Berlant and Boyer's work

by arguing for a view of infrastructure that sees opportunities in the severing of relationships and that focuses specifically on materiality as a resource that can be drawn on for the creation of new social and political structures. One of the advantages of this perspective is the ability to consider how infrastructures' geographic aggregation of material, in the present, might distribute future capacities for rebuilding and change.

Infrastructure past, present and future

For historians of technology and theorists of infrastructure, "infrastructure" as a phenomenon is characterized as any sociotechnical system that offers "near-ubiquitous accessibility" to people (Edwards, 2004: 186). In their recent work on the development and methods of infrastructure studies, Plantin et al. (2018) argue that infrastructure studies follows two "intellectual lines" (p. 295), where the first line focuses on large technical systems such as transportation networks, the expansion of communication networks, or the rise of mobile broadband connectivity. This literature emphasizes the building, standardization, and maintenance of such large-scale technologies.

A second intellectual line of infrastructure studies focuses on the sociology of infrastructure and its role in societies, articulating the social aspects of infrastructure dependencies for example (Bowker and Star, 1999; Star, 1990). Scholarship from this track (heralded by Susan Leigh Star) emphasizes the human impacts of infrastructures such as their inclusion, exclusion with master narratives, or enrollment in organizational cultures such as knowledge work.

One aspect of infrastructure studies that can be seen in both intellectual lines is a shared approach to temporality. For example, Lemke incorporates the principle of heterochrony, or the changes of time within a system (Lemke, 2000). Analyzing the transmission, context, vulnerability, or resilience of infrastructures is not possible without a commitment to timescales. By studying the conditions of possibility for things to exist, at moments of creation and then over time, examining the historical ontology of infrastructure provides a means of analyzing epistemological transformations (Ribes and Polk, 2012), emerging categories of knowledge (Bowker, 2000), and techniques of inscription (Latour and Woolgar, 1986). Curiously, however, both strands of infrastructure studies—whether focused on the development and uptake of technologies of scale or revealing the sociological impacts of infrastructure on human subjects—tend to consider temporality without engaging in real and imagined futures.

While much work on infrastructure aligns with the perspectives identified above, it feels increasingly pertinent to also enquire into infrastructure's futures. This is largely due to feelings of crisis and collapse that ride the coattails of recently developed understandings of topics such as the anthropocene, climate change and the failures of capitalism and neoliberal politics to address these looming threats. Infrastructures are both implicated in the perpetuation and acceleration of these threats just as they are affected by their consequences. As Edwards (2004) indicates, climate change reveals the futility of attempts to hold as entirely separate nature and technology when storms destroy infrastructures such as levees and bridges. Indeed, recent examples of infrastructures that will not persist, unchanged, into the future abound: from Detroit's abandoned neighborhoods to Flint's corroded water pipes to the breach of the levees during Hurricane Katrina. The increasing prevalence of natural disasters due to climate change is especially notable because highly visible damage to basic services such as transportation, water, and power systems draws attention to infrastructures that themselves contribute to the acceleration of climate change. And behind these hypervisible phenomena are more mundane examples of breakdown and

decay, as the shift from Keynesian to neoliberal governance over the past 50 years has left the United States with poorly maintained and underdeveloped infrastructures that have fallen into disrepair (Appel et al., 2018).

Civil infrastructures such as roads and bridges are currently assumed to have service lives of 50–75 years, and, as Ellingwood and Lee (2016) note, the actual service lives for many infrastructures will likely be much longer, stretching their maintenance requirements beyond a single lifetime. However, the concept of service life assumes ongoing maintenance and repair, and we might also talk about the extended material life of infrastructures that cease to function or to be consistently maintained yet continue to exist. Indeed, a strange and notable feature of many contemporary infrastructures is that, at the same time that they are decaying and collapsing, their scale and material composition make them likely to persist, albeit in non-functioning form, far into the future. As with the stone and concrete aqueducts built by the Romans almost 2000 years ago, many of the infrastructures of the 20th-century are likely to remain as material features of the landscape far beyond the point at which they cease to be maintained.

Perspectives on the future of infrastructure are split between these two poles: first, risk analysis and modeling (e.g. the calculation of service life) that largely attempts to control or account for breakdown and, second, theories that assume the inevitability of infrastructural collapse and view it as an opportunity for structural change.

Berlant's (2016) definition of infrastructure (encompassing, for example, roads and bridges as well as families and norms) is characteristic of the breadth the term has taken on in recent scholarly work. Across these diverse domains, a core concept in Berlant's perspective is the unique historical moment represented by the early 21st-century. Events such as the 2008 recession, austerity policies, and the Occupy movement, seen from this view, index "the infrastructural breakdown of modernist practices of resource distribution, social relation, and affective continuity" (p. 394). These events reveal "glitches" in the fabric of society and, at best, call for the creation of "a form from within brokenness beyond the exigencies of the current crisis, and alternatively to it too" (p. 393).

Crucially, however, Berlant does not see breakdown or glitches as the absence of structure or infrastructure; instead, one of her main contributions is drawing attention to the ways that ruptures can be normalized or repaired in ways that either perpetuate inequities or merely return the conditions that encouraged crisis, "collaps[ing] what's better into what feels better" (p. 399). Repair is a key term in this argument, a process that, as many theorists of infrastructure have noted, is constantly called for. Yet Berlant also stresses the often-hidden choice represented by repair: to either return to what came before or to grasp the opportunity to produce "nonreproductive" futures specifically enabled by brokenness.

Boyer (2018) is similarly concerned with how infrastructures can be converted into systems that do not perpetuate current trajectories. Like Berlant, he keys the need for reimagining infrastructure to the conditions of the present and specifically highlights the environmental catastrophes of the 20th and 21st centuries and the consequences of neoliberalism on both infrastructural development and infrastructural decay. Reminiscent of Berlant's worry that the repair of infrastructure merely reinstates a comfortable yet crisis-producing past, Boyer situates current infrastructures in relation to the Keynesian period that, compared with the wealth inequalities and personal precarities brought on by neoliberalism, seems to offer a return to familiar comforts. The current deteriorating condition of large-scale infrastructures in the United States can be directly related to this transition, with the public works projects and investment in infrastructure of the mid-20th century fading in the late 1970s to be replaced by an emphasis on privatization. While returning to large-scale public investment in infrastructure projects might feel good and even slow undesirable

developments, Boyer argues that this would also represent a return to the imperialism that ultimately brought about current conditions.

Beyond a concern over nostalgia for Keynesianism, however, Boyer's perspective is notable for beginning to outline a theoretical framework that suggests in more specific ways how transitions to "revolutionary infrastructure" might progress. Specifically, he aligns the possibility of optimism with the development of a range of posthumanist (e.g. Haraway, 1984; Wolfe, 2010) and new materialist (e.g. DeLanda, 2006; Harman, 2010; Morton, 2013) philosophies that respond to catastrophe by challenging the centrality of humans and turn instead to a focus on companion animals and materials. Where Berlant's conception of infrastructure is quite broad and concerned with social relations as with material systems like highways, Boyer exclusively considers infrastructure through large-scale projects and specifically those involved in manufacturing and distributing petroleum products. He sees these systems as more than material, stressing Larkin's (2013) definition of infrastructure as "things and also the relations between things" (p. 329). Specifically, Boyer considers infrastructure as congealed labor and expertise, such that an electrical grid represents the entanglement and perpetuation of engineering expertise and also a history of materials science and manufacturing that make available substances such as steel, concrete, ceramic, and silicon. Infrastructure, Boyer argues, stores these elements as a kind of potential energy held in suspension.

For Boyer, the point of noting infrastructure's status as potential energy is to imagine infrastructure as revolutionary, capable of not only reproducing systems but also of "blow[ing] the very same arrangement 'sky-high'" (p. 231). Similar to Berlant's call to see infrastructural glitches as opportunities to construct nonreproductive futures, Boyer's incitement to use the stored energy represented by infrastructure to challenge current systems is provocative. At the same time, both suggestions are fairly underspecified in that they indicate a broad way of thinking about infrastructure in the future without necessarily providing a way to discuss what might be relevant or meaningful about specific infrastructures. In analyzing moments in Robinson's science fiction trilogy in which infrastructure plays a role in producing alternative social or political forms, we attempt to identify ways that infrastructure might matter in and beyond times of transition.

Reading infrastructure in science fiction

If infrastructure is largely invisible in our everyday lives, it is certainly not so in recent science fiction. Indeed, beyond the focus on transportation and provisioning that tends to be necessitated by the genre conventions of technology-oriented science fiction focused on interplanetary travel, we are especially drawn to works that take place on recognizable, near-future versions of the Earth. Many recent novels in this vein are rooted in anxiety over approaching collapse, often associated with climate change but also with the large-scale infrastructures that provision current societies while also hastening their ends. Paolo Bacigalupi's *The Water Knife*, for example, imagines the United States during a severe drought, with private corporations struggling to control and sell to the wealthy the few remaining sources of water. *Gold Fame Citrus* by Claire Vaye Watkins is similarly set in a dystopian southern California, where extreme drought causes the US Bureau of Conservation to ration soda to citizens and enforce mass evacuations in response to an expanding sea of sand dunes, and in Sam J. Miller's *Blackfish City*, survivors of climate change live on a city floating in the Arctic but contend with resource and housing inequality that in many ways resemble our current conditions.

While we do suggest that reading science fiction is a provocative method for exploring new perspectives on infrastructure and their relationships to non-reproductive futures, we focus here on Robinson's Three Californias Trilogy, novels that have a distinct relationship to history (the 1980s) and place (southern California). We also draw on interviews with Robinson and critical statements on his work, taking these, together with the fiction, as representing a cohesive, if implicit, theory that can guide thinking about the future.

The novels comprising the Three Californias Trilogy were published between 1984 and 1990. Each imagines a different future for southern California and is modeled on a different genre of science fiction. The novels move from a society that feels inescapably bound to the sociopolitical system of America in the 1980s (*The Gold Coast*, cyberpunk); through a fragmented society that appears poised between regressive military nationalism, pastoral communalism or something new and strange (*The Wild Shore*, post apocalyptic); and ends with a society that is largely a socialist eco-utopia (*Pacific Edge*, utopian). In each of these speculative futures, infrastructure from the past plays an important role in characters' struggles to shape their societies and the landscapes they live in.

Robinson's work is often associated with utopianism, which he has described as "one course of history, a progressive course in which things become more just and sustainable over the generations" (qtd. in Robinson et al., 2004: 185). Indeed, while not referencing infrastructure, his comments on utopia and science fiction align strongly with Berlant's remarks on non-reproductive futures and the dangers of repair as a way of reproducing existing inequalities. Both the imperialism of Heinlein-esque science fiction and the dystopian focus on corporate control represented by cyberpunk, Robinson has argued, risk serving only as "mirrors of the present [. . .] portray[ing] the current triumph of capitalism as inevitable, eternal, and unbeatable" (p. 186).

Instead, Robinson's novels consistently experiment with the production of new societal forms and ways of living, from the early-career trilogy on which we focus here to his popular Mars trilogy—chronicling the multigenerational terraforming of Mars and exploring the societal possibilities that might attend it—and more recent novels such as *New York 2140*, which takes place in a New York City that has been flooded due to climate change. In many ways, Robinson's career has sought to answer a question very similar the one we pose in this essay: if present conditions lead inexorably to collapse, how can that collapse be used as a resource from which to build more equitable ways of life? We find Robinson's answer to this question provocative precisely due to his position as a utopianist who writes science fiction—as a writer who, in line with genre conventions, is especially interested in the possibilities and limitations of the material world but who also explicitly sets out to imagine the material world in ways that do more than repair the glitch of the present.

In the following sections, we consider moments from Robinson's Three Californias Trilogy that feature infrastructures constructed in the late 20th century. In attending to how characters view and interact with these partially ruined systems and landscapes, we draw out perspectives that pull in two sociopolitical directions: back toward the inequality of the 20th century as well as in another direction entirely, toward new and creative ways of life.

Beginning, digging

> Civilization kept moving west for thousands of years, in a sunset tropism, until they came to the edge here on the Pacific and they couldn't go any farther. And so they stopped here and *did it*. And by that time they were in the great late surge of corporate capitalism, so that everything here is purely organized, to buy and sell, buy and sell, every little piece of us. (Robinson, 1988: 3)

The Gold Coast opens on the Newport Freeway, where it intersects with the San Diego Freeway just outside of Irvine and the John Wayne International Airport. In this future, cars are guided along and powered by metal bands set into the lanes, and the freeway interchange is "a Gordian knot three-hundred feet high and a mile in diameter—a monument to autotopia" (p. 2). Jim—the novel's protagonist, adjunct college instructor, would-be poet and would-be anti-corporate activist—looks out at the sprawl and remembers that the area used to be covered with orange groves. He and his friends exit the freeway and park at a Fluffy Donuts Video Palace, which Jim explains is located 140 yards from the oldest building in the area, a Quaker church constructed in 1887, and which was built on top of the El Modena Elementary School, built in 1905 and razed in the 1960s. Jim narrates a transition from agriculture and community to commerce (it is unclear whether the store sells donuts or videos or both) and privatization. Correspondingly, the friends' mission for the night is to excavate that history, to dig through the concrete surface of the parking lot and attempt to retrieve the school's foundation stone as a gift for Jim's great uncle, who attended the school. If not an act of recreation, it is, for Jim, an act of memorializing—of seeing the place for its historical significance and of clearing away contemporary infrastructure to do so.

Beneath four inches of concrete, the friends encounter an inch of older asphalt. ("Great stratification at this site," remarks Jim (p. 5).) Beneath the asphalt is a layer of fill dirt and, finally, the foundation stone, which is too heavy to be moved, so they slice a piece off a hardwood support beam to take instead. "So this is the past . . . ," Jim thinks, looking at the wood (p. 7). Cut from the beam, the wood is not useful but symbolic. It represents an idealized past because of its association with the former school and with the history of the area, not because it resists warping or has load-bearing properties.

The scene sets out a primary theme of the novel, as well as the rest of the trilogy: the struggle to reconcile the past and, especially, its material remnants with the desire to build a better society. Indeed, all three novels begin with similar scenes of excavated infrastructure. *The Wild Shore*'s opening scene, for example, involves the main characters—adolescents who live in an agrarian community outside Los Angeles—digging up graves and discussing the possibility of melting down old railroad rails to extract valuable metals. In this vision of southern California, the social and political structures are strikingly different than in the dystopia of *The Gold Coast*. For the inhabitants of the village of San Onefre, society is already oriented around communal property, and the lack of books and reliable methods for transmitting information has created a situation in which ruins are partially cut off from their historical significance. However, due to the durability of large-scale 20th-century infrastructures, these ruins remain important features of the landscapes and still serve as important geographic markers. As the narrator remarks:

> It was the freeway that was the main sign that humans lived in the valley . . . the freeway, cracked and dead and half silted over and worthless. [. . .] Many was the time that the old man had told us tales of America, pointing down at the freeway and describing the cars, until I could see them flashing back and forth, big metal machines of every color and shape just flying along. (pp. 31–32)

Freeways, here, are both monumental and also unmoored; they exist in relation to the memories of cars, but, without cars, they play new roles in the landscape. Graveyards and railways have even fewer historical connotations, and the characters in *The Wild Shore* see a railroad rail or a casket primarily for their material properties. They do not have a firm understanding of the relations a casket or rail tie might have had in the past, but they can imagine what the materials might allow them to do in the present.

Pacific Edge begins with another scene of excavation. Kevin, the novel's protagonist, is performing required community labor with friends, unhurriedly demolishing the intersection of two four-lane streets. The parking lots and gas stations that surrounded the intersection have already been removed, the asphalt sent to refineries in Long Beach to be processed, presumably, into a more useful material. As the friends dig, their discoveries index the building components of the late 20th century: "telephone lines, power cables, gas mains, PVC tubing" (p. 2). The materials that make up the world of *The Gold Coast* and that surround the characters in *The Wild Shore*, albeit with their potential usefulness largely locked away, are, in the utopian novel *Pacific Edge*, rescued from wastefulness and reused.

Bomb, burn, renovate

In addition to railways, overpasses and intersections, a recurring element in Robinson's trilogy is housing infrastructure and specifically the inexpensive tract housing built in southern California during the city's expansion into the to agricultural areas to the south. As Jim argues in *The Gold Coast*, these infrastructures are equally bound with politics and the geography of state power: "Like the coming of the railroad, like all the other improvements in the efficiency of transportation, [construction of the Santa Ana Freeway] fueled the boom, and the military-industrial machine grew again" (p. 264).

In each of these novels, tract housing plays a variety of roles, but only in *The Gold Coast* is it portrayed as an active problem (and then, as always, only for some characters). The freeway system has expanded literally on top of suburban neighborhoods, which have been converted from single-family homes into multi-unit apartments huddling beneath the noisy concrete streets:

> The Foothill Freeway, in fact, extended into southern OC around the turn of the century. The land it needed to cross was by then completely covered by suburbia, and the homeowners objected strenuously to having their houses bought up and torn down. The solution? Make the new freeway a viaduct, part of the elevated autopian network being built over the most congested parts of the Newport and Santa Ana freeways. [. . .] Now it's a perfect place for white-collar poor folk like Jim to live, in apartmentalized old suburban homes. (p. 64)

Working from a similar perspective from when he excavated of the elementary school's wood beam, Jim sees Los Angeles' housing infrastructure through its relationship to an unjust political system, represented in the novel by both military contracting and real estate firms. Notably, when Jim's budding participation in direct actions against corporations intensifies, he targets not just weapons factories but also real estate companies and government offices responsible for zoning. However, the violence he enacts is for the most part symbolic; motivated to avoid casualties at a weapons factory, he instead launches a rocket at its entry sign, and, similarly, his attacks on real estate offices seem not so much intended to change housing infrastructure but more to express rage at a system that he sees as untouchable. Indeed, prior to the novel's conclusion, discussed below, the only escape that Jim is able to imagine is through a preserved natural area, portrayed as temporary refuge but one that ultimately has little to do with the inequalities of urban life.

Tract housing plays a much different role in the latter two novels of the series, both of which present the future as far less determined than the dystopian future of *The Gold Coast*. In *The Wild Shore*, the area south of Los Angeles forms a transitional zone between the agrarian society of San Onefre and the ruined city itself, described as a mysterious, violent zone where people referred to as "Scavengers" live off the material remains of the previous

society. Looking up at the former neighborhoods of San Clemente, the narrator describes the remains of houses,

> all set in rows like fish out to dry, as if there had been so many people that there wasn't room to give each family a decent garden. A lot of the houses were busted and overgrown, and some were gone entirely—just floors, with pipes sticking out of them like arms sticking up out of a grave (p. 9)

The transition zones of the suburbs inhabited groups of Scavengers who move through the rows of tract housing but, rather than maintaining them as symbols of material success, using them as sites to pilfer consumable materials. One by one, the Scavengers burn the houses for firewood and move on, leaving behind an empty landscape of concrete foundations and jutting pipes.

In an inversion of Jim's attacks on real estate offices, the conventions of the post-apocalyptic novels allow the Scavengers to encounter housing infrastructure entirely stripped of symbolic meaning. The houses do not reference a social structure, current or past, and the Scavengers do not see them in relation to the geography of state power. Rather, they see the abandoned houses as combustible fuel, and material properties that were downplayed or actively worked against in the past become the basis for an entirely new and strange way of living. While the Scavenger's pattern of literally burning through the past might not align with ideals of sustainability or, at least on the surface, of greater social equality, it does allow for the development of a society that is not merely recreating the structure or geography of the past. Indeed, rather than Los Angeles' suburbs and freeways serving as an easy conduit between the domestic and business worlds, bridging the city and the less urban surroundings, the Scavengers' appropriation of housing infrastructure actually transforms these areas into barriers that makes reaching the city more dangerous. This transformation is seen as much in their burning of tract neighborhoods as in the multiple scenes that present freeways surrounding Los Angeles as dangerous geographies of violence.

Pacific Edge presents the most straightforwardly utopian vision of the role that ruined infrastructure—represented by suburban tract housing—might play in the future. Kevin, the novel's protagonist, is an architect who specializes in remodeling houses to make them both more environmentally friendly and also to better align them with the social structures of the community (including, for example, communal housing and housing for single adults). As with the materials excavated from the intersection in the novel's opening scene, the perspective on housing focuses on converting infrastructure, using existing material as a useful skeleton or framework that, while it might in the past have supported one way of life can go on to form the material basis for radically different visions of shelter and home.

Living on, living within

Related to the question of how to think about ruined infrastructure, we have attempted to draw attention to the tension between seeing infrastructure in relation to its past relations and seeing it more in relation to its material properties, an approach that Robinson presents as leading away from the reproduction of former social structures. This tension is especially foregrounded in the trilogy's middle novel, *The Wild Shore*. In contrast to *The Gold Coast*—in which an unjust society is seen as virtually unchangeable—and *Pacific Edge*—in which multiple configurations of society and space jostle within a broadly socialist utopian framework—*The Wild Shore*'s post-apocalyptic setting creates the context for markedly divergent future possibilities. Specifically, the novel focuses on three possible futures for the

inhabitants of San Onefre: a return to militaristic nationalism, the continuation of a communal agrarian society, or a move toward the largely unprecedented society of the Scavengers.

Perspectives on infrastructure ground these competing visions of the future. We focus here on two representative images from *The Wild Shore*: first, a house built on top of an overpass overlooking the flooded valley of San Diego and, second, an electrical tower that has been converted into a house on the northern outskirts of San Onefre.

The house built on top of the overpass—an illustration of which appears on the covers of at least two editions of the novel—is a striking metaphor for the perspective on infrastructure of the inhabitants of San Diego. Much of the novel's plot focuses on the San Diegans attempts to restore the relations that defined the United States prior to the nuclear attack that destroyed much of the country. These relations are largely infrastructural and decidedly nationalistic and militaristic. In addition to attempting to rebuild sections of the California Southern Railway in order to connect communities along the California coast and eventually mount attacks on the Japanese who patrol the area, the San Diegans have a functioning radio and printing press and claim to be in contact with military bases in former Strategic Air Command centers buried under Cheyenne, Wyoming and Mount Rushmore. These acts of rehabilitation are, in Berlant's terms, specifically and purposefully reproductive, as the San Diegans always attach their work to the goal of reconnecting communities across the country, of which they note, "It's all one group, really, and the goal is the same. To rebuild America" (p. 105).

There is little apparent reason to build a house on a freeway overpass, especially one that has become structurally unstable from age and neglect, except for its symbolic connection to 20th-century infrastructure. By building on top of the object that made southern California the center of American suburbanization and related military industrialization, the San Diegans make clear their goal of pursuing a return to that time.

If the house on the overpass is primarily a symbolic use of ruined infrastructure, a house built into an electrical tower is a primarily material one. Constructed on the northern outskirts of San Onefre and inhabited by a man and his daughter who exist, socially, in a marginal space between the agrarian society of San Onefre and the migratory society of the Scavengers, the house represents a use of ruined infrastructure that has nothing to do with its former meanings or functions. And, where the San Diegans' approach to infrastructure obsesses over the reproduction of the past, the man and his daughter's perspective, like that of the Scavengers, projects out into an unknown future marked by both new societal forms as well as phenomenological experiences.

The house is "small but tall, and strong as a tree. The shingled walls sloped inward slightly, and the four metal struts of the tower protruded from the corners of the roof, meeting in a tangle of metal far above it" (p. 224). Clad in wood, the tower would appear quite different than the skeletal towers with which we're familiar, becoming a more solid and hybridly alien aspect of the landscape. Similarly, inside the house, characters experience sights and feelings never before associated with the structures. Raised above the landscape, for example, inhabitants are afforded views far into the distance and, most notably, when lightning strikes the house, the metal skeleton produces an experience as far from reproductively American as the Scavengers' burning through the suburbs: "The lightning hits and the whole house shakes," describes the man who lives in the tower, "and blue sparks are bouncing around like hummingbirds" (p. 227).

This reappropriation of electrical infrastructure produces new experiences, but it also rearranges the geography of the area, bringing people into spaces they would not previously have inhabited. Robinson's speculation, for example, suggests the dense, clumped suburban

grid replaced by the sparse lines of electric tower moving across the landscape. While the positioning of the towers was previously decided based on the logic and economics of electrical transmission, it is possible to imagine residential geography following behind these artificial constraints, with consequences for a society that might take up this new way of life.

Angry optimism

> Begin a new life. But how? It's just the same old materials at hand .... How do you start a new life when everything else is the same? (Robinson, 1988: 377–378)

> My story is: the optimism that I'm trying to express is that there won't be an apocalypse, there will be a disaster. But after the disaster comes the next world on. (Robinson qtd. in De Vicente, 2017)

In interviews, Robinson has described a perspective toward the future that he refers to as angry optimism, a concept he contrasts with Berlant's (2011) cruel optimism. Vis-à-vis cruel optimism, which naively attaches hopes for the future to the same systems that cause present crises, Robinson's angry optimism acknowledges inescapable, approaching ruin. Addressing the myriad problems associated with the present—climate change and the extinction of species, neoliberalism and attendant wealth inequalities—Robinson suggests a way of looking into the future that does not attempt to escape or control the dangers of the present or to return to the comforts of the past but instead looks forward to the possibilities of a time beyond these.

Robinson's angry optimism is at times ambivalent toward and at others deeply concerned with the problems of the present. He brushes aside complete human extinction as improbable while at the same time arguing that we should be working to prevent other species from going extinct. His recommendations for action differ from the repairs associated with cruel optimism, however, in their rejection of current systems; more or better of the same will not save us, he suggests, and he instead advocates constructing "mongrel situations" to ameliorate damage or work toward what Berlant refers to as nonreproductive futures. As an example of mongrel infrastructure, Robinson points to his novel *New York 2144*, in which polar bears are transported to Antarctica in order to preserve the species. In this way, Robinson's angry optimism involves, to some extent, setting aside history in order to survey the material possibilities that are available in the present and how they might be used creatively in the future. It is an ethos of finding value in the broken—a way of using the destruction of the present as a lever to free for new uses materials that might otherwise be constrained by convention or the momentum of social processes. In Boyer's terms, Robinson seems to suggest that collapse and crisis make available the energy that has been stored in infrastructure and free it for more creative uses.

The relationship between angry optimism and infrastructure can be seen in the Three Californias Trilogy, as well as in many of Robinson's subsequent novels. While his statements on angry optimism and mongrel assemblages are not specific to bridges, freeways or housing tracts, the central role that these objects play in imagining the future is still notable—and this pattern extends beyond Robinson's work to many recent examples of science fiction. In part, this tendency is likely due to infrastructures' material qualities and the probability that they will continue to dominate the landscape long after the relations that maintain them cease to exist. Engineers' calculations of service life, after all, only forecast the duration of infrastructures' functionality, and when they predict, for example, rates of

deterioration for concrete, their analysis does not ask when the overpass or bridge will cease to be a noticeable part of the landscape or a resource for future action.

In all three of these novels it is clear that infrastructures shape lives, reproduce inequalities, hasten environmental disasters—and that they also survive such disasters, at least in a non-functioning form. *The Gold Coast*, for example, primarily represents the ways infrastructures structure and restrict lives, as the housing and transportation infrastructures of a pre-collapse Orange County instill in Jim a deep sense of hopelessness. The systems around him—and especially the relationship between weapons contractors and the state military and between real estate developers and those who are forced to live literally in the shadows of freeways—are too big for him to affect. One way that he attempts to negotiate his place in this world is by historicizing his surroundings and by remembering the relationships that have ceased to be (but that also led to the current society). When he digs through the layers of the past in the novel's opening scene, the wooden beam he finds is seen in relation to its historical significance. Like the paint chip saved by the manager of the Belmont Station Apartments, it is seen as a historical reference more than a material object that has specific qualities and potentials.

However, two moments in *The Gold Coast* hint at the choice between crafting mongrel situations from material wreckage and failing to move beyond the significance of the present. Before conducting his futile attacks on military contracting facilities and real estate offices, Jim wrecks his apartment, tears apart his writing about Orange County, knocks his books off their shelves. Returning from his assault on the symbols of infrastructures he views as violent and unjust, he surveys the damage in his home, thinking that it is as if an earthquake has hit. He rearranges the fragments of his writing. He reshelves the books in a new order. Rather than centering on content and connotation, the scene is very much about the potential of material when seen as flotsam: not what is written on the paper so much as how it can be taped together into something new. Emphasizing a point that prefigures both Robinson's later statements on angry optimism as well as Berlant's discussion of non-reproductive futures, the narrator summarizes Jim's actions: "He's struggling to find a new pattern, working with the same old materials" (p. 376). Toward the conclusion of the novel, bookending the opening scene of excavation that seems to pose a question of what to do with the broken remains of the past, Jim dreams that he stands on a beach while above him, on a cliff, his friends and family tear apart a map of Orange County and drop the pieces down to where Jim is "trying to put together this big puzzle before the tide comes in" (p. 388).

The idea of collapse or ruin as a way of transforming infrastructure is picked up more literally in *The Wild Shore*, in which it is not a map of Orange County but the space itself that is torn apart and consequently made open to new possibilities. Striking components of infrastructure litter the landscape, pointing back to an unjust society and a violent state that closely resembles that of *The Gold Coast*. For the inhabitants of San Diego, putting the ruined map back together means reestablishing relationships with centers of state military power and restoring transportation and communication infrastructures to their former conditions. Because infrastructure relies so heavily on maintenance and repair, it plays a substantial role in shaping the rhythms of life, restoring infrastructure would also entail restoring a society. Notably, in relation to Berlant's arguments regarding cruel optimism, the novel hints that the same cold war military state and geography to which the San Diegans seek to return played a role in prompting the nuclear attack that destroyed much of the country and its infrastructure. Cruel optimism, in this case, runs through infrastructure and the processes required to maintain it. Like the mayor's house built on

top of the freeway overpass, cruel optimism is very much about the relationships that once existed, and it is less concerned with the material properties of current ruins.

In contrast to the cruel optimism that seeks to return prior infrastructures and, consequently, prior societal relationships, other aspects of the novel hint at the kinds of mongrel situations that Robinson associates with angry optimism and the hope for nonreproductive futures. The most relevant examples of these mongrel situations involve the Scavengers' appropriation of former infrastructures such as freeways and electric towers. Here, there is no attempt to put cars back on the roads or to use them as a conduit that allows people to live in one location but work in another. No one tries to make the electric tower function again or cares about its historical significance. Instead, inhabiting the tower spins the prior geography of Southern California in new directions. Following through with the metaphor of the torn map from *The Gold Coast*, if the San Diegans are trying to tape the map back together correctly, the Scavengers are rearranging the pieces and, consequently, experiencing the world in new ways.

The electric tower in *The Wild Shore* suggests more radical uses of infrastructure and more radical societal changes than do the descriptions of eco-utopias in *Pacific Edge*, partly due to the genre conventions of each novel. The post-apocalyptic novel is necessarily more open-ended than the novel that begins with a society that is, for the most part, already portrayed as a kind of utopia. Still, the excavation scene at the beginning of *Pacific Edge* is notable for highlighting how infrastructures can function as material repositories once they enter a state of ruin. The material comprising the intersection that the city's inhabitants dig up—unlike the wooden beam excavated at the beginning of *The Gold Coast*—is seen not for its historical connotations but for its capacities as material. Transported to a refinery of unspecified type, the material is suggested to be processed into a form that can be used in subsequent construction projects. What is specific to infrastructure, here, is accumulation and standardization: the scale of infrastructure tends to bring together large quantities of material, and the need for standardization creates a situation in which ruined infrastructures can be seen as common stockpiles for future creativity and societal transformation. However, the transition to material repository is predicated on the breakdown of relationships and on the willingness to take a perspective that avoids reproducing them.

This ability of infrastructure to be converted into material repository can be seen both in the current world and in other works of science fiction. Jackson's (2013) discussion of the work of shipbreakers—workers in Bangladesh who break down cargo ships, transforming them into metals and other materials that can be used again—for example, demonstrates how monumental components of the global shipping infrastructure serve as material repositories that reconfigure geographies. In this specific case, the movement of infrastructure redistributes materials and labor in ways that might prefigure the consequences of various collapse scenarios. Similarly, the perspective of angry optimism provides an opportunity to think about industrial waste in new ways, with electronic waste dumps perhaps seen as concentrations of certain materials or the nuclear waste storage facility of Onkalo seen as both a desperate act of prevention and also a stunning concentration of a rare material.

These infrastructural components redistribute materials, but they also redistribute capacities. In Robinson's *Red Mars*, materials are transported from Mars back to earth using a space elevator consisting of 35,000 kilometers of carbon nanotubes attached to an orbiting asteroid. At the end of the novel, characters purposefully destroy the space elevator by crashing the asteroid into the planet's surface, with the consequence that the elevator's massive tether wraps around the planet like a belt. No longer functioning as infrastructure, the tether can now be seen as six billion tons of raw material. Like the tract houses that the Scavengers live in, burn and move on from, these examples of infrastructure as material

aggregation are freed from the functions that their prior relations foregrounded. Standardized pine lumber, when integrated into the construction system, has relevant qualities (that align with the dimensions of walls, the length of nails and the load tolerances designed into residential structures). However, following a collapse of the relationships that make these qualities relevant, other capacities of the lumber—such as combustibility—can rise to the surface, transforming areas of (perhaps false) security and accumulation into spaces of migration and enabling new modes of consumptive use.

Seeing ruined infrastructures as repositories, however, does not only redistribute capacities related to material use. It also redistributes experiential possibilities, as Robinson's novels demonstrate. Living inside an electric tower, for example, affords views into the distance and also new visual phenomena and ways of existing in relation to weather patterns. Freeways and overpasses afford speed and fleeting glimpses when associated with cars, but stripped of that relation they afford new experiences and possibilities such as an elevated vantage point that does not have to be sped through.

Boyer's discussion of the distribution of oil and gas pipelines in the United States exemplifies the potential relevance of seeing infrastructure as the geographical aggregation of standardized material, as well as the ways that this perspective might extend or challenge current work on infrastructure. As Boyer notes, maps of oil and gas pipelines invert the usual emphasis on the country's east and west coasts by illustrating the accumulation of oil and gas infrastructure along the Gulf Coast and through the middle of the country. For Boyer, these pipes represent congealed expertise and labor, but our reading of Robinson's novels suggests that they are also material with potentials exceeding current use—that these infrastructures will persist and have unpredictable capacities once their conventional relations are broken down by catastrophe and time. The clustering of these capacities in the middle of the country, while not predictive, is certainly meaningful from this vantage point: not as a way of steering the future but perhaps as a resource for fueling speculative imaginings and for living within the changes to come.

Conclusion

A train emerging from a tunnel in Los Angeles bearing the banner "To Oblivion" both tells and hides the truth. Certainly, the public infrastructure represented by the Pacific Electric railway was heading for an end, to be replaced by the freeways that currently dominate southern California's landscape. However, a great deal of history emerged in that oblivion, as the infrastructure went on to have a series of unpredictable afterlives, from public art space to arena for ancient sports and recreation. Infrastructure does not disappear into oblivion; it persists and sometimes mutates. What is beyond oblivion is far more interesting than simple disappearance.

While infrastructure scholars routinely discuss the pacing of infrastructure, its historical ontology and specific relation to modernity—that is, concepts roughly falling under the category of time—it is strange that few grapple seriously with the future. This is especially troubling because of the special relationship that infrastructure presently has to the future: at once implicated in oncoming collapse and also materially destined to persist after such an event. If goals such as Berlant's non-reproductive futures and Boyer's revolutionary infrastructure are to be pursued, it feels necessary to supplement understandings of infrastructures as objects that have sociotechnical histories and shape lives in the present with perspectives that suggest moments of future possibility.

In this project, collapse is an inevitability and also a conceptual tool. As Robinson's novels suggest, disaster is a means to free material from pattern and use, allowing bridges,

overpasses, housing tracts, power plants and water pipes to be seen as massive, uneven aggregations of material with unforeseen capacities. In this way, disaster might make way for the "squatting in" and "repurposing" of infrastructure that Boyer (2016) associates with revolutionary infrastructures and the formation of novel societies (p. 184). Approaching disaster attunes us to the materiality and geographical distribution of infrastructure as aspects of the present that will persist into strange and unpredictable futures. Looming collapse helps us to imagine, now, not necessarily what revolutionary infrastructures might look like but certainly the ways in which existing infrastructure might come to matter in their development. Grappling with infrastructures' futures in this way is a hopeful method for current times.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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