## 11 Rethinking Repair

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"There is a crack in everything. That's how the light gets in."
Leonard Cohen, *Anthem*

What world does contemporary information technology inhabit? Is it the imaginary nineteenth-century world of progress and advance, novelty and invention, open frontiers and endless development? Or the twenty-first-century world of risk and uncertainty, growth and decay, and fragmentation, dissolution, and breakdown?

This chapter is an exercise in broken world thinking. It asks what happens when we take erosion, breakdown, and decay, rather than novelty, growth, and progress, as our starting points in thinking through the nature, use, and effects of information technology and new media. Broken world thinking is both normative and ontological, in the sense that it makes claims about the nature of technology and its relationship to broader social worlds, some of which may differ from deep-rooted cultural assumptions. But it is also empirical and methodological, an argument and provocation toward doing new and different kinds of research, and new and different kinds of politics, in media and technology studies today.

There are two basic components of the approach advocated here. The first is an appreciation of the real limits and fragility of the worlds we inhabit—natural, social, and technological—and a recognition that many of the stories and orders of modernity (or whatever else we choose to call the past two-hundred-odd years of euro-centered human history) are in process of coming apart, perhaps to be replaced by new and better stories and orders, but perhaps not. We know, now irrefutably, that the natural systems we have long lived within and relied on have been altered beyond

return (though not necessarily beyond repair, in the sense articulated here); by any reasonable expectation, we are now living, as Bill McKibben (2010) has argued, on a sort of Earth 2.0 in which many of the old socionatural bets are off. The instabilities of the postwar economic order and the social relations attendant upon it have recently come home to roost (as many of us are reminded as we watch friends, neighbors, and family members fall out of the hopes, comforts, and securities of the middle class). The form and possibility of the "modern infrastructural ideal" (Graham and Marvin 2001) is increasingly under threat, as cracks (sometimes literal ones) show up in our bridges, our highways, our airports, and the nets of our social welfare systems. For these and other reasons, broken world thinking asserts that breakdown, dissolution, and change, rather than innovation, development, or design as conventionally practiced and thought about are the key themes and problems facing new media and technology scholarship today.

Attached to this, however, comes a second and more hopeful approach: namely, a deep wonder and appreciation for the ongoing activities by which stability (such as it is) is maintained, the subtle arts of repair by which rich and robust lives are sustained against the weight of centrifugal odds, and how sociotechnical forms and infrastructures, large and small, get not only broken but *restored*, one not-so-metaphoric brick at a time. On this road we travel the path from despair to admiration, even reverence, and are confronted above all by the remarkable resilience, creativity, and sheer magnitude of the work represented in the ongoing maintenance and reproduction of established order.

Here, then, are two radically different forces and realities. On one hand, a fractal world, a centrifugal world, an always-almost-falling-apart world. On the other, a world in constant process of fixing and reinvention, reconfiguring and reassembling into new combinations and new possibilities—a topic of both hope and concern. It is a world of pain and possibility, creativity and destruction, innovation, and the worst excesses of leftover habit and power.

The fulcrum of these two worlds is *repair*: the subtle acts of care by which order and meaning in complex sociotechnical systems are maintained and transformed, human value is preserved and extended, and the complicated work of fitting to the varied circumstances of organizations, systems, and lives is accomplished. Repair in this connotation has a literal and material dimension, filled with immediate questions: Who fixes the devices and

systems we "seamlessly" use? Who maintains the infrastructures within and against which our lives unfold? But it also speaks directly to "the social," if we still choose to cut the world in this way: how are *human* orders broken and restored (and again, who does this work)?

Some of these effects are captured in the language of "articulation work" so usefully described by Susan Leigh Star and Anselm Strauss (1999). Articulation is about fit, or more precisely, the art of fitting, the myriad (often invisible) activities that enable and sustain even the most seemingly natural or automatic forms of order in the world. Articulation supports the smooth interaction of parts within complex sociotechnical wholes, adjusting and calibrating each to each. In building connections, it builds meaning and identity, sorting out ontologies on the fly rather than mixing and matching between fixed and stable entities. Articulation lives first and foremost in practice, not representation; as its proper etymology suggests, it's a creature of bones, not words. When articulation fails, systems seize up, and our sociotechnical worlds become stiff, arthritic, unworkable.

The same broad features characterize the work of repair—itself a facet or form of articulation work (and vice versa). Repair is about space and function—the extension or safeguarding of capabilities in danger of decay. But it is also an inescapably timely phenomenon, bridging past and future in distinctive and sometimes surprising ways. Repair inherits an old and layered world, making history but not in the circumstances of its choosing. It accounts for the durability of the old, but also the appearance of the new (a different way of approaching the problem of innovation, as will be discussed: behind and prior to the origin stands the fix). Above all, repair occupies and constitutes an *aftermath*, growing at the margins, breakpoints, and interstices of complex sociotechnical systems as they creak, flex, and bend their way through time. It fills in the moment of hope and fear in which bridges from old worlds to new worlds are built, and the continuity of order, value, and meaning gets woven, one tenuous thread at a time. And it does all this quietly, humbly, and all the time.

So the world is always breaking; it's in its nature to break. That breaking is generative and productive, in ways that will be sketched later in this chapter. It is also consequential, and many of the things we care about as media and technology scholars turn out to be implicated in precisely such moments. And it is always being recuperated and reconstituted through repair. The question then becomes what we make of these facts, and what we do next.

## Shipbreaking

One place to begin is the following:



**Figure 11.1**
Edward Burtynsky, *Shipbreaking #4*.[5]

The image, *Shipbreaking #4*, comes from photographer Edward Burtynsky's beautiful and evocative series on the shipbreaking industry of Bangladesh. As the series proceeds, we follow Burtynsky's lens through the amazing process by which aging ocean vessels (the bone and sinew of globalization) are beached, stripped, and dismantled; a parallel series, *Ship Recycling*, follows the ghostly afterlife of these ships, as their fragments get dispersed and repurposed through a variety of local markets. Or if the work of the shipbreakers seems too exotic or obscure, consider any of the following: the e-waste scavengers who reclaim precious metals, often under horrendous and unregulated conditions, from processors, monitors, printers, and cell phones in landfills around the world (Burrell 2012); the ubiquitous cell-phone repair stands that now show up (alongside food stalls, bicycle repair,

and jerry-can gas operations) as regular features of roadside commerce in sub-Saharan Africa and other developing countries (Jackson, Pompe, and Krieshok 2011, 2012); or the work of the Wikipedia editors, crafting, honing, and maintaining entries against error, ambiguity, and vandalism.

Burtynsky's photos and the additional examples given earlier tell us important things about the themes of breakdown, maintenance, and repair raised here. The first is the extent to which such work is rendered invisible under our normal modes of picturing and theorizing technology. Burtynsky's photos share, in exquisite detail, a side or moment of technological life that goes for the most part unrecognized. On one level, these activities are entirely routine, a normal and inevitable feature of technology's course in the world. Things are made, and things fall apart. Objects are produced, and objects are discarded. Technologies are developed, and technologies fade into history, leaving rarely more than a trace behind. But our modes of academic and popular representation around these two moments of technological life are deeply unbalanced. If we are to understand maintenance, repair, and technology more broadly, scenes such as Burtynsky's must be made empirically and conceptually familiar, even normal. This may require some effort of the analytic imagination, trained as we have been in technology and the social sciences by the primacy of production and design. It may help then to be reminded of the sheer weight and value that such activities represent. By some estimates, 80 percent of the world's commercial ocean fleets end up on the beaches of Bangladesh or in neighboring India in this way. And 80 percent of the domestic steel industry in Bangladesh (which has no naturally occurring ore deposits) is sourced in this way. However far from a Western and productivist imagination, these activities are anything but marginal.

Burtynsky also reminds us of the consequences and distributions of breakdown and repair—a point of significance for the discussions of power and knowledge that follow. These are not, in almost every case, Bangladeshi ships coming home to a final resting spot, nor are the workers on these beaches attached or supported (save by this one connection) to the wider worlds of trade and commerce that these ships have come from. (That, indeed, is why the ships come *here*: to be disassembled and repurposed free of the responsibilities and entanglements that would necessarily follow in other places.) Because we don't see it, it is easy to forget that the forms of breakdown and repair practiced on the beaches of Bangladesh come at the end of a complex and consequential distribution, with deep and troubled ties to global economic flows and structures; as Doreen Massey (1994) reminds and Burtynsky affirms, some are more on the receiving end of globalization than others.

Finally, the beautiful ebb and flow of Burtynsky's images remind us that while their modern flavor and intensities may vary, activities such as this are ancient, even timeless ones, and have always been part of the story of technology, humans, and the sea. Activities such as this form part of the secret history of breakdown, maintenance, and repair that has always sustained (but invisibly) the higher profile stories of exploration, empire, and globalization that shipping, quite literally, has carried. This is a point with deep and surprisingly invisible roots. Ask yourself this: for all the representations of great ships in history you've encountered, at what times and in what forms have you seen such vessels? In almost every instance it will be at moments of birth, or at the heights of strength and glory: the christening before the maiden voyage, rounding the cape, facing down the Spanish fleet, and so on. But what happens (or *happened*) to these ships? Save for the special cases of hostile sinking, shipwreck, or honorable retirement and preservation, it was this: they were disassembled, repurposed, stripped, and turned into other things, in sites and locations like the shipbreaking beaches of Bangladesh that have dropped out of history and imagination.

This chapter argues that breakdown, maintenance, and repair constitute crucial but vastly understudied sites or moments within the worlds of new media and technology today. It argues that much of what we care about as media and technology scholars is implicated or enacted in exactly such moments, and that the productivist bias of the field obscures this fact. It asks how we might begin to think differently around the phenomena of breakdown, maintenance, and repair, and how we might use this difference to launch other and more hopeful programs of research. And it argues for the contributions that broken world thinking and a repair-centered ethics might make to the project of defining an appropriate moral and practical stance vis-à-vis the world of media and technology today.

## Repair and Innovation

At first glance, nothing could seem farther apart than the apparently separate questions of innovation and repair. Innovation, in the dominant coding, comes first: at the start of the technology chain, in moments of quasi-mythical origination, a creature of garage-turned-corporate engineers, operating with or without the benefits of market research and user experience operations. Repair comes later, when screens and buttons fail, firmware is corrupted, and the iPhone gets shipped back to wherever iPhones come from. (We generally prefer to think not at all of what happens *after* such moments, in the piles of e-junk accumulated in attics and landfills

or shipped overseas to Africa or Asia.) In scientific computation and collaboration, the language of innovation is generally reserved for new and computationally intensive "bright and shiny tools," while repair tends to disappear altogether, or at best is relegated to the mostly neglected story of people (researchers, information managers, beleaguered field technicians) working to fit such artifacts to the sticky realities of field-level practices and needs. In both cases, dominant productivist imaginings of technology locate innovation, with its unassailable standing, cultural cachet, and valorized economic value, at the top of some change or process, while repair lies somewhere else: lower, later, or after innovation in process and worth.

But this is a false and partial representation of how worlds of technology actually work, when they work. In practice, there's nothing unassailable about the contribution that innovation (in this narrow sense) makes. Against fans and critics of design alike, innovation rarely if ever inheres in moments of origination, passing unproblematically into the bodies of the objects and practices such work informs. For this reason, the *efficacy* of innovation in the world is limited—until extended, sustained, and completed in repair. The remarkable qualities and energies that innovation names and unleashes—creativity, invention, imagination, and artfulness—are therefore distributed more broadly in the technology landscape than our dominant discourses of innovation and the systems of economic, professional, and social value built around them are keen to acknowledge. They also often depend, as the standpoint discussion to follow will explore, on precisely the kinds of breakdowns charted here. From this perspective, worlds of maintenance and repair and the instances of breakdown that occasion them are not separate or alternative to innovation, but sites for some of its most interesting and consequential operations.

For the same basic reasons, repair—perhaps especially under conditions of modern industrial production—may constitute one of our most significant sites and sources of sociotechnical difference. Whether at the level of national "technological styles" (Hughes 1987) that shape and differentiate the nature of "same" technologies in different national contexts, or the simple but consequential variations by which industrial commodities are brought into, enlivened, and sustained within the circumstances of individual homes and lives, repair may constitute an important engine by which technological difference is produced and fit is accomplished. It may also be the case that breakdown and repair are very often the aspects or portions of broader technological systems that show the most variation across national, cultural, or other comparative contexts, as a growing body of work on the distinctive repair ecologies of the developing world

has begun to demonstrate (see, for example, Jackson, Pompe, and Krieshok 2012; Burrell 2012). To repurpose Tolstoy "All working technologies are alike. All broken technologies are broken in their own way."[2]

How might we begin to reverse this dominant view, and reimagine or better recognize the forms of innovation, difference, and creativity embedded in repair? Burtynsky once again gets us started. One of the more impressive features of Burtynsky's series and the cultural practices it references is the apparent technological simplicity with which Bangladeshi shipbreaking is conducted. Confronted with the bewildering size and array of a modern ocean freighter (and in sharp contrast to the technological conditions surrounding its production), teams of workers armed with nothing more sophisticated than a blowtorch are able to separate, dismantle, and repurpose a ship and its constituent parts in a matter of weeks. Under anything other than the most stubborn of productivist imaginations, this activity can only appear as a remarkable feat of innovation, and the site of a remarkable and distributed expertise.

Or, to take an example closer to home, consider the Internet. As explored by historians like Janet Abbate (1999). the incredible development of the network form and capacity of the early Internet—surely one of the central innovation stories of our day—did not follow anything like the smooth or automatic curve that production-driven or law-like representations of IT growth have suggested (think here of the various "laws"—Moore's, Kryder's, Butter's, and so on—that have been offered to explain the explosive growth of computational processing, storage, and network transmission capacities). Instead, as Abbate documents, the Internet grew by *breaking*, bumping up against the limits of existing protocols and practices and working around them, leaving behind almost by accident some of the properties that we now enumerate as key and distinctive virtues of the Internet as an infrastructural form. Far from being a generalized cultural tendency or a property of individual minds, innovation in the technology space, as in culture more generally, is therefore organized around problems. This makes innovation simultaneously specific and in some measure collective in nature. And its engine is breakdown and repair.

Such starting points might lead us toward new and alternative programs of empirical research in the technology and innovation space, with special attention to the existence, dynamics, and tensions of innovation beyond moments of ideation, design, and up-front adoption. For example, it is telling that some of the most consequential work emerging from early ethnographic work in the IT design and human–computer interaction fields—some of it conducted in industrial research labs—has centered

on repair (Suchman 1987, Orr 1996). The same broad interest has begun to show in other fields ranging from sociology (Henke 2000, Graham and Thrift 2007) and architecture (Brand 1994), to environmental planning (Hetherington 2004) and engineering (Petroski 2006). My own work with collaborators in this space (Jackson, Pompe, and Krieshok 2011, 2012) has explored the distinctively different landscapes of technology repair that characterize the extension of information technology infrastructure in sub-Saharan Africa. If the broad sense of this chapter is correct, such early empirical forays only begin to scratch the surface of the possibilities and forms of creativity, innovation, and difference to be found in the work of repair.

## Knowledge/Power and Repair

Thorny questions of knowledge and power have, since Foucault (1980) at least, formed a crucial strand in our thinking about the nature and status of technology in social life. We know, from experience and long traditions of work in the social sciences, that questions of visibility and invisibility may be intimately linked to power. The ability to limit or manage external visibility of our lives and work, or conversely to exert the force of our gaze on others, has long been recognized as a crucial site for the operation of power in institutions, in workplaces, in culture in general. At the same time, visibility may be tied crucially to systems of reward and recognition: think only of the differential visibility of faculty and nighttime cleaning staff on American university campuses and its relation to the highly skewed distributions of income that follow.

But a second set of links among visibility, power, and knowledge in the context of maintenance and repair needs to be considered, one with perhaps special relevance to the analytic and methodological interests that frame this volume. The question is this: can repair sites and repair actors claim special insight or knowledge, by virtue of their positioning vis-à-vis the worlds of technology they engage? Can breakdown, maintenance, and repair confer special epistemic advantage in our thinking about technology? Can the fixer know and see different things—indeed, different worlds—than the better-known figures of "designer" or "user"? Following on the claims of Hegelian, Marxian, and feminist theorists, can we identify anything like a standpoint epistemology of repair?

The question has deep and suggestive roots. Social theorists of multiple stripes have acknowledged the special place of breakdown in the opening to thought of heretofore hidden dynamics, processes, and powers. Take

Heidegger's notion of "tool-being," built around the central distinction between tools that are "ready-to-hand" versus "present-at-hand" (Heidegger [1977] 2008b; see also Harman 2002). In the former state, technologies function as anticipated, do and stay where they're supposed to, and therefore sink below the level of conscious reflection. In the latter, the material world resists, obstructs, or frustrates action, and therefore calls attention to itself (precisely because we must now work to figure out and overcome barriers in our no-longer seamless world). The same basic insight informs American pragmatist theories of mind and consciousness. For theorists like James ([1907] 2000) and Dewey (1896, 1922), the possibility of consciousness begins where habit and routine fail and thought is called on to take over for rote or reflexive action. Broadly parallel insights by Vygotsky (1962) and subsequent generations of activity theorists position breakdowns or gaps (for example, the crucial distance between learner and teacher that constitutes a generative "zone of proximal development") not as barriers or irreducible divides, but rather dynamic resources and engines for change. It is therefore precisely in moments of breakdown that we learn to see and engage our technologies in new and sometimes surprising ways. The same broad principle has been taken up in more recent work in new media and technology studies, for example, Bowker and Star's (1999) observation that technologies and practices which rise (or sink) to the level of infrastructure are frequently invisible until breakdown, and that special acts and moments of "infrastructural inversion" may be required to call these phenomena and their associated politics back to the center of thought and action.

Such insights call attention to the world-disclosing properties of breakdown, and the distinct epistemic advantages that can follow from moving repair (and repair workers) to the center of our thinking about new media and technology today. Breakdown disturbs and sets in motion worlds of possibility that disappear under the stable or accomplished form of the artifact. Thus a standpoint epistemology of repair may offer a different response to the longstanding problem of commodity fetishism, by which the meaning and politics of technology are obscured, stripped, and neutered, and the fiction of separate "social" and "technological" worlds is produced. If Marxism seeks to disrupt the commodity fiction of the object by connecting it backward to moments of origin, discovering the congealed forms of human labor, power and interests that are built into objects at their moment of production, broken world thinking draws our attention around the sociality of objects forward, into the ongoing forms of labor, power, and interest—neither dead nor congealed—that underpin the ongoing survival of things as objects in the world. In doing so, it may hold up a

clear and revealing light to relations of value and order that are sometimes made invisible under the smooth functioning of complex sociotechnical systems.

**Repair, Maintenance, and the Ethics of Care**

Finally, foregrounding maintenance and repair as an aspect of technological work invites not only new functional but also *moral* relations to the world of technology. It references what is in fact a very old but routinely forgotten relationship of humans to things in the world: namely, an ethics of mutual care and responsibility.

An important source for this thinking comes from the world of feminist scholarship, in particular an interrelated body of work emerging from the 1970s through the 1990s across the fields of ethics, sociology, and political theory. Against deontological theories of truth and ethics and the virtues of impartiality and universalism such theories upheld (think Rawls's [1971]) "veil of ignorance" and the theory of justice that was built on it), this body of work sought its grounding in the strength, variance, and responsibility of interhuman relations. From this perspective, to be human is to bear certain burdens of ethical dependence and responsibility vis-à-vis a world of other ethical actors. Those burdens are shaped and discharged in specific rather than categorical relations. Running through and beneath the whole system is an "ethics of care," predicated on a baseline moral relationship that linked, bound, and shaped ethical responsibility in chains of mutual entanglement and dependency. This ethics constitutes the basis of political claims making, and the condition of possibility for a collective moral life (Gilligan 1982). It also establishes the moral baseline or starting point from which we might begin to recognize and discharge our moral responsibilities in the world—vis-à-vis other ethical actors, but also an expansionary world of things that we, individually and collectively, are increasingly implicated in producing and consuming.

But why should we care about care? For the purposes of understanding media and technology—how it's produced, what it does, what powers and freedoms it opens up and forecloses—the language of care does double work. As elaborated here, it speaks to the ongoing work of maintaining media artifacts, systems, and technologies; it is itself a form of tailoring, appropriation, and resistance (to use language more commonly appearing in media and technology scholarship). But it also opens up an important moral and political terrain. To care for something (an animal, a child, a sick relative, or a technological system) is to bear and affirm a moral relation to

it. For material artifacts, this goes beyond the instrumental or functional relations that usually characterize the attachments between people and things. Care brings the worlds of action and meaning back together, and reconnects the necessary work of maintenance with the forms of attachment that so often (but invisibly, at least to analysts) sustain it. We care because we care.

Thus, the ethics of repair admits of a possibility denied or forgotten by both the crude functionalism of the technology field and a more traditionally humanist ethics (which has mostly ignored technology anyway). What if we care about our technologies, and do so in more than a trivial way? This feature or property has sometimes been extended to technologies in the past, but usually only ones that come out of deep folk or craft traditions, and rarely the products of a modern industrial culture. Heidegger's writings, for example, are full of such distinctions between modern and premodern technologies (centered on such canonical figures as bridges and jugs), which confront and engage the world in radically different ways: for modern technologies, after the manner of "testing" ([1977] 2008b); for folk and craft devices, under a gentler and more supple form of "gathering" ([1977] 2008a). Richard Sennett (2009) has written beautifully of traditions of craft and the special relationship between worker and the object of labor this has historically produced. The decline of craft traditions—which Sennett extends in principle to modern pursuits as varied as medicine and computer programming, parenting and citizenship—constitutes a significant weakening of our connection to the worlds of goods and work we inhabit today.

Some of the best and most intriguing work in new media and technology studies today has begun to challenge and question this assumption, for example Sherry Turkle's (2007) insistence on the deep and meaningful relations between humans and "evocative objects;" Lucy Suchman's (2006) attention to "affiliative objects" and the work of human–machine reconfiguration at the heart of much information research and technology today; N. Katherine Hayles's (1999) posthumanist exploration of the deep and growing entanglements between the worlds of people and of things in robotics and artificial intelligence; and Bruno Latour's (2004) and Donna Haraway's (1991) alternative treatments of cyborg or collectivist ontologies, presenting ways of thinking that *don't* rest on the presumption of a bright red line between people and things running through our lives and politics.

The tricky proposition for media and technology studies posed by broken world thinking and other posthumanist approaches is this: is it possible to love, and love deeply, a world of things? Can we bear a substantive

ethical, even moral, relationship to categories of objects long consigned to a realm of thin functionalism (a mistake that many of the dominant languages of technology research and design—"usability," "affordances," and so on—tends to reify)? What if we can build new and different forms of solidarity with our objects (and they with us)? And what if, beneath the nose of scholarship, this is what we do every day?

## How to Fix Technology Studies

These three themes—innovation, knowledge/power, and the ethics of care—constitute missing elements or dimensions of the way we in new media and technology studies typically think about breakdown, maintenance, and repair (when we think about it at all). But they also raise new challenges and opportunities in the study of technology more generally, some of which connect to the very old problem of how to frame a more humane and progressive politics of technology.

We should begin by guarding against the twin analytic dangers of nostalgia and heroism, two properties that have often challenged left-leaning and progressive thinking about technology in the past. To begin, while broken world thinking calls special attention to the work by which technologies and practices are sustained in the world, it has no automatic preference for stasis over change—another good reason for putting innovation (rather than preservation or conservation) front and center in our discussions of maintenance and repair. Nor does it hearken back to a lost age of harmony and balance in our relationships with technology. While it's true that different technologies emerge from and instantiate different regimes of maintenance and repair, the form of broken world thinking advocated here rejects the idea of making this the basis for large-scale distinctions between, for example, modern and premodern technologies (one of the places where the broken world thinking advocated here departs from Heidegger [1977] [2008b] and later-twentieth-century critical theorists of technology, from Marcuse [1964] to Ellul [1964]). By the same token, repair is not always heroic or directed toward noble ends, and may function as much in defense as in resistance to antidemocratic and antihumanist projects. One thinks here of the remarkable recuperative routines and strategies by which the atrocities of Nazi ambition and the Nazi war machine were normalized and sustained within the production systems and civil society of war-time Germany (Arendt 1963, Goldhagen 1996).

Such cautionary notes aside, broken world thinking offers fresh potential to both longstanding and emergent approaches in media and technology

studies today. First, and if nothing else, it can help us think beyond the remarkably restricted and usually binary sets of actors that have dominated media and technology studies to date: senders and receivers, producers and consumers, designers and users. The world of technology is more complex and less orderly than that, full of dynamics, tensions, and powers that neat binary distinctions—and the systems of explanation built on them—struggle to explain. Modes of thought that expand our cast of characters, including but certainly not limited to the breakers, fixers, and maintainers highlighted here, are therefore necessary and promising additions to the field.

Second, attention to maintenance and repair may help to redirect our gaze from moments of production to moments of sustainability and the myriad forms of activity by which the shape, standing, and meaning of objects in the world is produced and sustained—a feature especially valuable in a field too often occupied with the shock of the new. More robust theoretical and empirical engagement with maintenance and repair can help remedy the productivist bias that persists in some of the field's central approaches: the social construction of technology, for example, with its emphasis on up-front moments of stabilization and path dependency (Bijker 1997, Hughes 1987); studies of technology or network diffusion (Rogers [1962] 2003), with their emphasis on the spread of technology or messages with arguably less regard for local variations and staying power in the sites they travel to; or concerns with media or technological appropriation (Silverstone 1994) which still tend to emphasize early moments of encounter and domestication in the encounter between technology and social groups. Robust attention to maintenance and repair work may complement and extend the core research interests of any and all of these programs, and is certainly not opposed in spirit or principle to any; indeed, insofar as broken world thinking adds weight to the argument against technology's autonomy and self-sufficiency, it extends the core move toward the socialization of knowledge and technology shared by each.

Third, maintenance and repair may have particular contributions to make to our thinking around the *timeliness* of technology—something we have, as a field, been remarkably bad at to date. Some of the reasons for this are obvious and already referenced: the privileging of design and production, emphasis on moments of initial encounter, and general predilections for the new. Some are more subtle and perhaps difficult to address: the differential pull factor of student, colleague, and sometimes funder interest as exerted on new as opposed to old technologies ("That's so 2009!"); the frequent obscurity and ephemerality of maintenance and repair work,

which leaves few of the documentary or statistical traces that systems of production do; and the deep methodological challenges of conceptualizing and studying time in general. Setting aside such challenges, bringing maintenance and repair work to the fore in our thinking about technology may help to extend and fill out this temporal story, offering new insights and approaches to the understanding of technology as a timely or rhythmic phenomenon (Jackson et al. 2011).

Fourth, recentering maintenance and repair may help with the necessary project of building bridges to new and adjacent fields whose methods, insights, and modes of work hold great promise to complement and enrich our own (and vice versa). This includes growing or prospective interfaces with fields like material culture (Miller 2005); craft studies (Sennett 2009; McCullough 1998); technology for development; and the diffuse body of work around sustainability studies. It may also help build new analytic connections to cultural phenomena—maker and DIY communities, craft and slow food movements, and cultural forms from fan fiction to the steampunk movement—that feature breaking, maintenance, and repair as central sites of activity and meaning.

Finally, moving maintenance and repair back to the center of thinking around media and technology may help to develop deeper and richer stories of relationality to the technological artifacts and systems that surround us, positioning the world of things as an active component and partner in the ongoing project of building more humane, just, and sustainable collectives. In June 2012 controversy erupted around the design of the retina display on Apple's newly redesigned MacBook Pro computer. As early reviews enthused and critics conceded, the new MacBook Pro was a functionally and aesthetically elegant machine, continuing recent trends in Apple design toward simple, compact, and seamless functionality predicated on the tight control and integration of hardware and software elements. It was also, as Kyle Wiens of iFixit.org[3] reported in a review for *Wired* magazine, "the least repairable laptop we've ever taken apart":

Unlike the previous model, the display is fused to the glass, which means replacing the LCD requires buying an expensive display assembly. The RAM is now soldered to the logic board—making future memory upgrades impossible. And the battery is glued to the case, requiring customers to mail their laptop to Apple every so often for a $200 replacement. The design may well be comprised of "highly recyclable aluminum and glass"—but my friends in the electronics recycling industry tell me they have no way of recycling aluminum that has glass glued to it like Apple did with both this machine and the recent iPad.

Defenders of the new machine and broadly similar design choices in Apple's MacBook Air series, the iPad, and a host of industry competitors quickly responded. Some argued that repairability was an increasingly outmoded virtue in electronics and in any case a necessary victim of the trend toward ever more compact and mobile design. Others noted that electronics repair was irrelevant to the vast majority of consumers anyway, who were more inclined to throw away than repair even the older and more fixable generation of personal computers. Still others argued that the debate about repair was moot, since consumers had effectively voted with their feet and wallets, consistently opting for size and functionality over more upgradable and fixable designs.

But the controversy did not end here. Over the long July 4th weekend of 2012, Apple quietly announced its intention to withdraw thirty-nine of its products from the Electronic Product Environmental Assessment Tool (EPEAT), a green ratings system supported by the U.S. Environmental Protection Agency and leading firms in the electronics industry (including Apple itself), arguing that "[Apple's] design direction was no longer consistent with EPEAT requirements," including the ratings system's "easy to disassemble using common tools" requirement. Reaction was swift. Users on Apple fan sites registered their dismay, noting Apple's past record of green-friendly innovations and the perceived inconsistency between the company's brand image and the decision to withdraw from EPEAT. Municipal governments, universities, and other institutional buyers that had incorporated EPEAT standards into their procurement process announced their decision to review all Apple purchases. Bloggers and technology news sites like ArsTechnica and Slashdot covered the story extensively, fanning and amplifying the initial controversy. On July 13, 2012, Apple rescinded its decision, announcing its intention to rejoin and renew its relationship with EPEAT. In an open letter on the Apple website, Senior Vice-President of Hardware Manufacturing Bob Mansfield reaffirmed Apple's past and continuing accomplishments in energy efficiency and the move away from toxic chemicals like brominated flame retardants (BFRs) and polyvinyl chloride (PVC), and vowed to work with EPEAT to update and extend green standards and practices in the electronics and computing industries.

## Conclusion: Learning from Benjamin

One of the inspirations and patron saints for this project is the great German literary critic and social theorist, Walter Benjamin. Living through the dying days of the Weimar Republic and the rise of fascism (a force that would

eventually destroy him), Benjamin nevertheless produced some of the gentlest, most inspiring, and most deeply humanistic criticism of a period not known for those virtues. In his peculiar, fragmentary, archival, and recuperative mode of working (best exemplified in the fragments of his brilliant but unfinished "Arcades" project [Benjamin 1999]), Benjamin also provides one possible example of a broken world methodology, or what scholarly work predicated on the assumptions and conditions of broken world thinking might look like. This sensibility is further reflected in his choice of historical subjects: not princes, leaders, and the products of high culture, but the detritus of nineteenth-century commercialism, the layabouts and ragpickers with whom Benjamin periodically aligns his own work.[4]

Finally, Benjamin leaves us some of modernity's most arresting images. My favorite, and the one which best captures the heart of broken world thinking, starts with a reflection on the 1920 Paul Klee painting *Angelus Novus*: (see figure 11.2). Here, from a piece titled "Theses on the Philosophy of History," is Benjamin's commentary on the work:

A Klee painting named "Angelus Novus" shows an angel looking as though he is about to move away from something he is fixedly contemplating. His eyes are staring, his mouth is open, his wings are spread. This is how one pictures the angel of history. His face is turned toward the past. Where we perceive a chain of events, he sees one single catastrophe which keeps piling wreckage upon wreckage and hurls it in front of his feet. The angel would like to stay, awaken the dead, and make whole what has been smashed. But a storm is blowing from Paradise; it has got caught in his wings with such violence that the angel can no longer close them. This storm irresistibly propels him into the future to which his back is turned, while the pile of debris before him grows skyward. This storm is what we call progress. (1969, 257–258)

This remains one of our most vivid and shocking indictments of a progressivist history. In place of a grand historical march toward freedom or salvation, or the forward and certain momentum of Marxian dialectics, we are left with this: a catastrophe, blowing blindly backward into the future, an image made all the more horrific by the poignancy of the angel's frustrated desire "to stay, awaken the dead, and make whole what has been smashed."

But this is not where Benjamin concludes. In the end, Benjamin winds up in the arcades of nineteenth-century Paris, studying poets and ragpickers, and finding grounds for resilience and hope. In the aftermath of history and its lineage of wreckage and debris, he quietly goes about the business of collecting and recuperating the world around him.

So: do we live in late modernity, postmodernity, alternative modernity, or liquid modernity? Knowledge societies, information societies, network

**Figure 11.2**
Paul Klee's painting *Angelus Novus*.[6]

societies, or risk societies? New media, old media, dead media, or hyperme-
dia? The world of information, the world of search, the world of networks,
or the world of big data?

The answer is simple: like every generation before, we live in the
aftermath.

## Acknowledgments

## Notes

1. *Anthem*. Written by: Leonard Cohen ©1992 Stranger Music Inc. All rights admin-
istered by Sony/ATV Music Publishing LLC, 8 Music Square West, Nashville, TN,
37203. All rights reserved. Used by permission.
2. See Tolstoy's opening lines to *Anna Karenina* (1886): "All happy families are alike.
All unhappy families are unhappy in their own way."

3. This is a nonprofit organization dedicated to technology repair, recycling, and
consumer education whose activities include Consumer Reports®-style "teardowns"
of leading products in the computing and consumer electronics sectors. See http://
ifixit.org, accessed April 22, 2013.

4. Quoting the French edition of Baudelaire's *Oeuvres*, volume 1, Benjamin writes,
"'Here we have a man whose job it is to gather the day's refuse in the capital. Every-
thing that the big city has thrown away, everything it has lost, everything it has
scorned, everything it has crushed underfoot he catalogues and collects. He collates
the annals of intemperance, the capharnaum of waste. He sorts things out and
selects judiciously: he collects like a miser guarding a treasure, refuse which will
assume the shape of useful or gratifying objects between the jaws of the goddess of
Industry.' This description is one extended metaphor for the poetic method, as
Baudelaire practiced it. Ragpicker and poet: both are concerned with refuse" (Benja-
min 2003, 48).

5. Photo © Edward Burtynsky, represented by Nicholas Metivier, Toronto / Howard
Greenberg and Bryce Wolkowitz, New York. Images from the *Shipbreaking* and *Ship
Recycling* series are available at http://www.edwardburtynsky.com/.

6. © *Angelus Novus*, 1920 (Indian ink, color chalk, and brown wash on paper), Paul
Klee (1879–1940)/The Israel Museum, Jerusalem, Israel/Carole and Ronald Lauder,
New York/The Bridgeman Art Library.