

Creating a Language of and for Sociotechnical Change: Interdisciplinary Sites, Stakes, and Senses of Transformation

MIKE ANANNY
SIMOGNE HUDSON
University of Southern California, USA

The study of sociotechnical change—differences achieved through human-nonhuman relations—is a core concern of many disciplines and communities. Even a desire to *prevent* change needs an understanding of which differences are more or less likely, achievable, or lasting. Whether as sites (places) or agents (instruments) of change, sociotechnical systems offer a rich set of aspirations, forces, dynamics, and outcomes for seeing how relationships between people and materials create, resist, interpret, endure, or ignore differences. Nurtured through the interdisciplinary research group Media as SocioTechnical Systems, this article and the forum that it anchors examines “sociotechnical change” from a variety of historical, disciplinary, methodological, and normative perspectives, offering short accounts of change intended to be complementary, generative, provocative, and playful.

Keywords: *sociotechnical change, human-nonhuman networks, science and technology studies, communities of practice*

Change is everywhere and endless. Even calls for stability and tradition are often about trying to stop or reverse change. Nearly everyone has a wish list of what they want to change (about others, themselves, circumstances, environments), how they think change happens, which changes are important, and how fast change should happen.

Technologies enter the picture as both *sites* of change—things that transform in ways that are more or less visible and knowable—and as *instruments* of change—tools that trigger shifts in people and environments. Whether as sites or instruments, the changes envisioned and engendered by technologies are always relational shifts in human-nonhuman couplings and actions. Most people have folk theories, hopes, and fears centering on how sociotechnical systems—ideas about how people-machine couplings might *create* change and should *themselves* change.

Because change of and through media technologies is perennial, the language for describing and mobilizing sociotechnical change is both stable and dynamic. Communication, media studies, science and technology studies, and countless other intellectual traditions have conceptualized and traced sociotechnical change for decades, with the challenge of doing so remaining today.

This forum is an experiment in developing cross- and interdisciplinary languages of change in and through sociotechnical systems. From the climate crisis and racial injustices to artificial intelligence and political instabilities, there is no shortage of simultaneous, intertwined, mutually defining phenomena that need precise answers to the questions of which sociotechnical system is changing, how it is changing, who is driving the change, and what visions of the future or past the change privileges. Each short article traces change, and taken together, they show approaches to studying and enacting sociotechnical change that is timely, interdisciplinary, generative, and even playful.

Sociotechnical Perspectives on Change

Change always has a backstory. Regardless of what changes—a person, organization, method, technology, story, or opinion—some set of forces is always responsible. Depending on who or what experiences or witnesses change, the forces driving it are more or less visible, traceable, appreciated, impactful, and alterable. People might change how they see themselves or their habits, organizations might change their missions, methods may become more reliable, technologies can seem safe or risky, memories fade, opinions evolve. All stories of change have central characters presumed to be responsible, arcs and rhythms that slow and quicken change, and assumptions about harm and progress that code change as good or bad, inevitable or resistible.

This forum focuses on *sociotechnical* change: how relations shift between humans and nonhumans, why those shifts matter, and what they say about “the problem of securing the social order” (Law & Bijker, 1992, p. 293), an order created when the “heterogeneity” and “contingency” of sociotechnical systems collide to make technologies seem stable, predictable, and “working” (Bijker, 1995, p. 275). Indeed, the analyst of sociotechnical change must seek out collisions that have been hidden by assumptions of history, norms, power, control, and agency (Marx, 2010; Star, 1991; Wajcman, 1991). Seeing seemingly static systems as dynamics that change and sustain human-nonhuman relations prompts shows not just how particular sociotechnical systems work but the labor required to make them seem stable and unchanging.

Students of sociotechnical change have countless objects and sites. They could be the “concepts, techniques, and resources used in a community” (Law & Bijker, 1992, p. 301), the “artful integrations” across “discontinuous worlds” (Suchman, 1994, p. 37), or the myriad “obligatory passage points” (Callon, 1986, p. 206), “rules” (Daston, 2022), “standards” (Yates & Murphy, 2019, “enactments” (Orlikowski, 2000), “habits” (Chun, 2016), “momentums” (Hughes, 1994), “intentions” (Parvin & Pollock, 2020), “chokepoints” (Carse, 2020), “controversies” (Marres, 2021), “errors” (Lin & Jackson, 2023), and “problems” (Savransky, 2021) that make people-object relations seem stable or natural, brittle or surprising. Seeing sociotechnical changes as either accomplishments or opportunities—stabilized dynamics or relationships to reform—means seeing sociotechnical change as normative achievements. Depending on one’s perspective, changes might be feared, anticipated, coerced, routinized, insignificant, transformative, or legitimate. Feelings about change—as shocking, existential, overdue, slow, and insufficient—are visceral reminders that all systems “might have been otherwise” (Bijker & Law, 1992, p. 3).

Forum Context

In assembling this forum, we invited writers to interpret sociotechnical change broadly. We asked them to consider which ideals of “better” or “worse” drive change, the outcomes changemakers wanted to repeat or avoid, and the metrics of “success” in evaluating change. We asked them to analyze the people, objects, artifacts, and practices that change convenes and which parts of change are seen as knowable, predictable, resistible, or inevitable. We prompted them to see the rhythms, timelines, paces, and deadlines structuring sociotechnical changes, and the problems, controversies, hopes, and fears that motivate them. And we asked them to look for the metaphors, imageries, and languages that inspire and communicate change.

The breadth of this prompt grew out of the interdisciplinary culture of the group that produced and nurtured the articles. The invitation to participate in this forum was extended to members and “friends” of the group Media as SocioTechnical Systems (MASTS), a diverse collection of scholars primarily based at the University of Southern California but with participants from around the world. With people from different fields and intellectual traditions—communication, journalism, engineering, media studies, law, policy, American studies, cinematic arts, political theory, sociology, and anthropology—MASTS met weekly over spring 2023 to brainstorm topics, hone ideas, develop drafts, and publicly present essays. MASTS—and this forum—aims to convene people from different traditions under “big tent” sociotechnical themes (like change) in ways that help people see how the different interests, motivations, methods, and investments that characterize their “home” disciplines can be deployed and challenged in ways that create new knowledge, help people grow, and are simply more fun than staying within a silo.

The articles are also formed in a moment of “syndemics” (Callison, 2021): multiple, co-occurring, connected, and mutually defining planetary problems. Pandemic lockdowns and Zoom life were in our recent memory and created a conversational backdrop as we met virtually and in person, with differently felt anxieties about COVID-19’s power, significance, and ubiquity. As a kind of group therapy, we would casually reference crumbling democracies or warming planets, testing out how we and others felt through syndemic gallows humor. We talked about how historically disempowered and racialized people and their allies used technologies to mobilize and fight for social change. Fires, floods, polluted air, heat waves, and power outages reminded us that the climate crisis is here, now. Rapid popularizations of artificial intelligence systems prompted questions about how authorship, authenticity, and ownership change with media technologies. This syndemic backdrop and our interdisciplinary group’s tendency to see everything as connected to everything pushed us to take seriously Callon’s (1987) call that analysts should be self-aware and explicit about the “mass of silent others” (p. 96) that we enroll into our projects and stories, and intentional about “which heterogeneous elements from both ‘inside’ and ‘outside’ the project” (Law & Callon, 1992, p. 22) we included.

Sociotechnical change was all around us and palpable in our conversations about agency, urgency, and ways of knowing. In an era that challenged solidarities, we found ourselves converging and diverging about which agents of change we thought were significant and which outcomes were desirable, necessary, or attainable. Though our group includes people from different disciplines, traditions, and methods, we share a propensity for openly acknowledging our normative investments, being honest about

how we wish the world *would be* and our obligations to create change as scholars. As we developed our articles and shared why we thought they mattered, we got to know each other better. Change was not just a theme that tied our work together; it was a way to learn about ourselves and our group.

We also asked participants to create in their articles what sociologist Arlie Hochschild (2016) calls “keyhole issues” (p. 26)—small openings or empirical curiosities that, when focused on and seen from novel perspectives, can reveal new places and relationships that are otherwise invisible, inaccessible, or seemingly settled. We explicitly asked authors not to tackle change through grand theories or broad generalizations, but to use seemingly small phenomena as objects to think, “sensitizing concepts” (Blumer, 1954, p. 7), and pointers to “middle theory” (Merton, 1968) that connect empirical details with big ideas. No article is a generalizable story of sociotechnical change (generalizability is not our aim), but they all provoke new appreciations of human-nonhuman relationships and, taken together, are rich reflections on sociotechnical change.

Article Themes

The authors in this volume engage sociotechnical change through an array of sites, methods, and orientations that trace human-nonhuman transformations across temporal, spatial, and theoretical contexts.

For some authors, sociotechnical change has distinctly *spatial* dynamics that play out locally in Los Angeles. Robertson and Nyuapane interrogate SoFi stadium in Inglewood, California, to show how stadiums produce “dynamic spatial and temporal rhythms and flows.” They trace the stadium’s construction to show it as a networked infrastructure that weaves together communities at risk of displacement, gentrification, and exclusion. Orr’s ethnographic study of the Los Angeles homeless count shows how knowledge production practices often assume stable statistics and counting methods, ignoring the powerful role that uncertainty plays in sociotechnical change. Like Robertson and Nyuapane, Orr’s study shows how Los Angeles’s most vulnerable communities embody flows and rhythms of relations that often go unnoticed. Widera adopts a similarly spatial perspective to trace the history of “jaywalking” and show how it disproportionately affects the unhoused. In his history of an ever-more-powerful urban “motordom,” Widera argues that focusing on sociotechnical change shows how shifting practices of care and notions of blame can be read in vehicle-pedestrian collisions. While Ahn’s article takes the reader on a road trip from Los Angeles to Michigan, she tells the story of how dominant orientations to space shifted as maps moved from analog to digital. As mapmaking switched from nonprofit groups to massive technological entities, she argues that corporeal experiences of space were largely abandoned in favor of selling data about the movement of bodies.

Other papers trace sociotechnical change within discrete *communities of practice, nations, and cultures*, situating change dynamics and commitments among interested stakeholders. Shestakofsky and Petre argue that institutions and structures of capital are key (and understudied) drivers of sociotechnical change, particularly as tech companies chase the visions of change subtly signaled by venture capitalists looking for growth. They pair complementary ethnographic investigations to show how venture capital influences product developments and organizational cultures, arguing that flows of capital drive types,

paces, and scopes of sociotechnical change. Lyamuya examines innovation in the United Nations High Commissioner for Refugees (UNHCR), showing how their “Innovation Service” initiative structures a culture of experimentation that signals which novelties are prioritized when developing new tools and technologies. As with Shestakofsky and Petre, Lyamuya shows the power of capital, arguing that the UNHCR’s pursuit of external funding catalyzes different development priorities and timelines of change. Hegde’s paper takes us to the island nation of Tuvalu to see how the country is planning to digitize its lands and traditions into the metaverse as it anticipates the climate crisis and sea level rise. This plan, though, Hegde argues, leaves Tuvalu vulnerable to archival surveillance, a loss of digital sovereignty, and a thin form of virtual empathy. By showing us how “environmental destruction begets a new frontier of sociotechnical change,” Hegde complicates “questions of privacy, citizenship, and humanity within an uncharted digital future,” and invites us to critically analyze cultures and communities change when physical transformations and digital translations collide. Echoing Hegde’s focus on changing notions of national sovereignty, Madebo reinterprets meanings of digital diaspora and nationhood change in her study of how diasporic youth took up Instagram during Ethiopia’s 2020–22 war. Madebo sees this technology as a key catalyst for collective identity formation and performance, for formations of nationhood and nationalism intertwined with platform affordances like Unicode emoji that mark and complicate national identity.

Finally, other authors focused on *genres* of change, inviting critical theoretical examinations of what sociotechnical change might look like conceptually. Sited in South Africa, Bhorat’s article considers what happens in the wake of, or in reaction to, sociotechnical *failure*. He argues that failure is “not always or only negative,” and sees sociotechnical failure as a chance to rebuild, reshape infrastructures, and show how the politics of infrastructural breakdowns can prompt change. Bhorat interrogates the history, ownership, and governance of South African electrical infrastructures by recontextualizing power “loadshedding” as a funerary economy where the mass deaths of chickens show how imminent demise, finality, and failure *enliven* change. Hong offers the concept of plasticity to trace racializations of sociotechnical change, specifically how adaptations in telecommuting reinforce and advance predetermined and racialized contours of labor. This labor, in Hong’s account, is a site for seeing how shifts in biopolitical technologies emerge from subtle clashes among definitions of work, leisure, adaptation, and resilience. Finally, Moradi and Levy’s three-part story of the autopen—a powerful but curiously understudied technology for automating signatures—shows how sociotechnical change shifts meanings of authenticity. Their cases show frictions between efficiency and sentimentality, identity and representation, embodiment and oversight, using the autopen to follow embedded and materialized values of investment, accountability, and care across distinct cases of autopen controversies. In their paper, sociotechnical change is a lens for seeing how technological objects convene and challenge social values and interpersonal connection.

Conclusion

Individually and together the articles give us more precise language for observing, explaining, and creating sociotechnical change. By situating historical dynamics between people and materials (e.g., maps, crosswalks, pens) in contemporary contexts (e.g., social media, digital archives, power grids) with normative stakes (e.g., migration and labor, national identity, climate justice) the forum offers novel, interdisciplinary,

generative, and even playful ways to understand what sociotechnical change is and to imagine what it *could* be.

We developed this collection in a time of great uncertainty, but we tried to recast our interests in (and anxieties about) change as actionable interventions, as invitations to see change differently and differently possible. Each article should thus be taken as a provocation—a prompt to find and witness change, follow change across intellectual traditions and methodological divides, and think about our opportunities and obligations to challenge conventions and *make* change.

References

- Bijker, W. E. (1995). *Of bicycles, bakelites, and bulbs: Toward a theory of sociotechnical change*. Cambridge, MA: MIT Press.
- Bijker, W. E., & Law, J. (1992). General introduction. In W. E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 1–14). Cambridge, MA: MIT Press.
- Blumer, H. (1954). What is wrong with social theory? *American Sociological Review*, 19(1), 3–10. doi:10.2307/2088165
- Callison, C. (2021). *What COVID-19 and climate change teach us about "syndemics."* Retrieved from <https://policyoptions.irpp.org/magazines/march-2021/what-covid-19-and-climate-change-teach-us-about-syndemics/>
- Callon, M. (1986). Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, action and belief: A new sociology of knowledge* (pp. 196–233). London, UK: Routledge & Kegan Paul.
- Callon, M. (1987). Society in the making: The study of technology as a tool for sociological analysis. In W. E. Bijker, T. P. Hughes, & T. Pinch (Eds.), *The social construction of technological systems* (pp. 83–103). Cambridge, MA: MIT Press.
- Carse, A. (2020). The feel of 13,000 containers: How pilots learn to navigate changing logistical environments. *Ethnos*, 88(2), 264–287. doi:10.1080/00141844.2019.1697337
- Chun, W. (2016). *Updating to remain the same: Habitual new media*. Cambridge, MA: MIT Press.
- Daston, L. (2022). *Rules: A short history of what we live by*. Princeton, NJ: Princeton University Press.
- Hochschild, A. (2016). *Strangers in their own land*. New York, NY: New Press.

- Hughes, T. P. (1994). Technological momentum. In M. R. Smith & L. Marx (Eds.), *Does technology drive history?* (pp. 101–114). Cambridge, MA: MIT Press.
- Law, J., & Bijker, W. E. (1992). Postscript: Technology, stability, and social theory. In W. E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 290–308). Cambridge, MA: MIT Press.
- Law, J., & Callon, M. (1992). The life and death of an aircraft: A network analysis of technical change. In W. E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 21–52). Cambridge, MA: MIT Press.
- Lin, C. K., & Jackson, S. J. (2023). From bias to repair: Error as a site of collaboration and negotiation in applied data science work. *Proceedings of the ACM on Human-Computer Interaction*, 7(CSCW1), 131. doi:10.1145/3579607
- Marres, N. (2021). No issues without media: The changing politics of public controversy in digital societies. In J. Swati & J. Wasko (Eds.), *Media: A transdisciplinary inquiry* (pp. 228–243). Chicago, IL: Intellekt.
- Marx, L. (2010). Technology: The emergence of a hazardous concept. *Technology and Culture*, 51(3), 561–577.
- Merton, R. K. (1968). On sociological theories of the middle range. In R. K. Merton (Ed.), *Social theory and social structure* (pp. 39–72). Boston, MA: Free.
- Orlikowski, W. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science*, 11(4), 404–428.
- Parvin, N., & Pollock, A. (2020). Unintended by design: On the political uses of “unintended consequences.” *Engaging Science, Technology, and Society*, 6, 320–327. doi:10.17351/estss2020.497
- Savransky, M. (2021). Problems all the way down. *Theory, Culture & Society*, 38(2), 3–23. doi:10.1177/0263276420966389
- Star, S. L. (1991). Power, technologies, and the phenomenology of conventions: On being allergic to onions. In J. Law (Ed.), *A sociology of monsters: Essays on power, technology, and domination* (pp. 26–56). London, UK: Routledge.
- Suchman, L. (1994). Working relations of technology production and use. *Computer Supported Cooperative Work*, 2(1–2), 21–39. doi:10.1007/BF00749282
- Wajcman, J. (1991). *Feminism confronts technology*. University Park: Pennsylvania State University Press.

Yates, J., & Murphy, C. N. (2019). *Engineering rules: Global standard setting since 1880*. Baltimore, MA: Johns Hopkins University Press.