

## Counterfactual History and the History of Technology

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Jack Brown's recent article in T&C opens up a new topic for historians of technology: the role of counterfactuals. As Brown notes, there are many possible varieties of "counterfactual history," and it's not entirely clear what they share in common. In this essay, I question the existence of "counterfactual history" while endorsing counterfactual reasoning in the history of technology. Such reasoning is, I argue, an essential tool for historians of technology, a tool that, as Brown argues, helps guard against the powerful pull of Whig, presentist, and determinist history. I am not, however, convinced that counterfactual approaches differ fundamentally from earlier critical approaches to the history of technology, especially the analysis of alternative paths.

There is, I claim, no such thing as counterfactual history. Historians do use counterfactuals all the time as an analytical tool, a method for uncovering causal connections. But analyzing a counterfactual question is not the same as constructing a "what if" narrative, a tale spun out of imagining what would have happened if some event in the past had occurred differently. Such tales are exercises not in history but in historical fiction. Historical fiction can certainly illuminate the past, but it requires a form of literary imagination foreign to most historians.

Let's be clear about what a counterfactual is. It is simply a conditional statement in which the "if" clause (the "protasis") makes a claim contrary to fact, usually stated in the subjunctive mood (Doring 1998). For historians, counterfactuals are statements about what would have happened in the past if some historical fact had been otherwise. For example, some historians have claimed that if there had been no American Civil War, slavery would have disappeared anyway (Ransom 1999, 34). Even though premised on a falsehood, such counterfactual statements can still be judged true or false. In *Time on the Cross*, Fogel and Engerman presented strong evidence that slavery would have remained economically viable in the American South, absent legal prohibitions. This evidence suggests that the above counterfactual statement that slavery would have disappeared anyway is false. Obviously, truth claims about counterfactual statements are far less certain than truth claims about what actually happened. One can make a logical, factually supported argument that American slavery would have ended even without the Civil War, but only disordered minds would argue that in fact there was no Civil War.

Why would historians use counterfactuals? After all, history deals with what did happen, not what didn't. But historians also make causal claims about what happened. Historians use counterfactuals because they are closely linked to a common-sense understanding of causation. The claim that event A caused event B implies that if A had not occurred, B would not have occurred. Counterfactuals therefore serve as thought experiments to test causal claims. Judgments about causes are interwoven in historical narratives, elevating history above chronicle.

Although counterfactual statements pose no major problems in everyday language, they bedevil philosophers because they cannot easily be reduced to the principles of formal logic. It is difficult to specify the precise conditions that make a counterfactual true or false, since they are in principle untestable. The philosophical problems of counterfactuals are, quite frankly, of little consequence to historians; our subject matter cannot support the logical rigor demanded by academic philosophy. However, one philosophical approach to counterfactuals is suggestive for historians, the notion of "possible worlds," that is, alternative worlds that are conceivable variants of the world we know. In logical terms, one cannot say whether a counterfactual is true or false in our world. But one can, under certain assumptions, make truth claims about counterfactuals when considering the set of all possible worlds.

This idea of possible worlds, though contested among philosophers, is suggestive for historians. In effect, when historians make causal claims, they imply counterfactuals that would be true in a closely related possible world. This argument applies equally to claims of historical contingency, the argument that events could have turned out otherwise. Claims of contingency are also claims about possible worlds, worlds that obey the same law-like regularities as our own, but where chance and human agency produce different outcomes.

Literary theorists, among them Umberto Eco, have also appropriated the concept of possible worlds (Koskima 1999). The distinction between history and fiction is in fact not sharp; in both fields practitioners weave together fact and imagination. Even the most bizarre fictional narratives, if they are to make any sense, must be rooted in the facts of human experience. Historians must also exercise their imaginations to weave the traces of the past into a coherent story, filling gaps with inferences, judging significance, and positing the motivation of actors. But in contrast to writers of fiction, historians must subordinate their imaginations to the constraints of evidence.

Such constraints pose a particularly difficult task for the exercise of the historical imagination. The writer of fiction is free to imagine a world that portrays human agency in all its contingency and complexity. The historian, in contrast, faces the deceptive certainty of the past. Because the past is determined, and cannot be otherwise, it is often difficult to imagine that it could have been otherwise. This is where counterfactuals play a key role in the historical

imagination, by revealing the contingency in history, the human choices that could have produced different results.

Recovering contingency is especially difficult for historians of technology, given the dominant fetishism that endows technology with agency. This fetishism is not only widespread in popular media but also among academics, for example among devotees of actor-network theory. As David Noble argued decades ago in *Forces of Production*, this technological fetishism serves to obscure the political economy of technology, the play of interests that shapes not just the technological choices but also the distribution of benefits and harms. When counterfactual reasoning serves to unmask this fetishism, history of technology can provide a critique of the established order, in politics as well as technology.

My analysis implies that counterfactual reasoning serves two main purposes, one causal and the other critical. Brown suggests something similar in his distinction between "constrained counterfactuals," which are causal, and "paths not taken," which are normative. While this distinction is useful heuristically, all history is ultimately normative. The idea that things can be otherwise, along with the positing of alternative possible worlds, all have a powerful moral implications. Likewise, ignoring alternatives is also a normative judgment, an implicit endorsement of the dominant historical path.

These arguments lead me to conclude that counterfactual reasoning is especially crucial for historians of technology. Such reasoning is not new; it was enshrined in "alternative paths" approaches that were popular in the 1980s and 1990s. These approaches all emphasized the role of collective human choice in shaping technological change, whether at the level individual artifacts or entire system of production. But these alternatives were not figments of the historian's imagination, but rather actual plans, prototypes, and often production models, alternatives taken seriously by some of the key actors of the time. When David Noble argued that record-playback was a viable alternative to numerically controlled machine tools, he based his argument on an actual prototype machine developed by General Electric after World War II (Noble 1984). When Charles Sabel and Jonathan Zeitlin published their 1985 article on historical alternatives to mass production, they provided numerous examples of technologically progressive industrial districts where flexible craft methods competed successfully against system of mass production (Sabel and Zeitlin 1985). When Pinch and Bijker used the story of the bicycle to illustrate the social construction of technology, they drew on historically available bicycle designs to demonstrate the contingency and social shaping that led the present-day bicycle (Pinch and Bijker 1984). My own analysis of the shift from wood to metal airplanes drew similarly on successful wooden aircraft to show that the eventual triumph of metal was not simply a matter of technical criteria (Schatzberg 1999).

Brown's fascinating "constrained counterfactual" analysis of the Eads Bridge in St. Louis has much in common with this historical alternatives approach. Brown examines the actual competition that led to the choice of the design by Eads. Brown shows that the rejected alternative was not only viable but almost certainly more economical than Eads's design. Brown admits that the rejected proposal, which used a conventional Post truss design, would perhaps not have been as robust as the Eads bridge, but most railroad bridges of the era were not designed for longevity. Ultimately, Brown demonstrates that the Eads Bridge was not in fact a path-breaking technical triumph, but rather the product of political intrigue, hubris, and cultural meanings of technology. In other words, Brown uses constrained counterfactuals to help refute an entrenched piece of Whig historiography, the old story of the triumph of the new over the old.

Like historical alternatives, the idea of constrained counterfactuals encourages historians to look for alternative solutions that exist in principle for every technical problem. Counterfactual analysis reminds us that technological change is always technological choice, the selection of one path among many. This does not mean that alternatives are seriously considered in all or even most cases, especially once a technology becomes entrenched. And even when alternatives were considered, evidence for them does not always survive. Yet in my own experience, I have found that evidence for alternatives can usually be found if historians look for it. Such evidence is often hidden in plain sight, made invisible by the dominance of the successful technology.

My own work on the continued development of wooden military aircraft in the 1930s provides a clear example (Schatzberg 1999). Metal structures became standard for high-performance military aircraft in the mid-1930s, and wood pretty much disappeared from new designs. Yet the wooden alternative did not die, but was kept alive by a few dissenters who saw the potential of wood in combination with new synthetic resin adhesives. The research of these dissenters, though marginal, was openly discussed in trade and technical journals, and by 1937 prototype models of molded plywood began to appear. I had no need to posit a counterfactual path for wooden airplanes; one actually existed, but it had been almost completely ignored in the scholarly history of aviation. The persistence of the dissenters proved fortunate. When serious shortages of aluminum emerged in Britain and the United States at the start of World War Two, all major combatants built airplanes with wood structures, including the de Havilland Mosquito, one of the most successful combat aircraft of the war. The story of the Mosquito provided powerful evidence of the viability of this alternative path.

My interest in this alternative path was not descriptive but rather in support of a causal argument. Because a few airplane firms continued to use wood for high-performance airplanes, I was able to argue that wood could have been employed on a much larger scale for airplanes through at least through World War II, especially if governments and firms had supported more R&D into novel wood structures. This claim is counterfactual, an extrapolation from what did

happen to what could have happened. This counterfactual, grounded in historical evidence, supports my argument that the choice of metal was driven in part by the symbolic meanings of the materials, what I termed the "progress ideology of metal." Because the actual performance of wooden airplanes contradicted the technical claims made by advocates of metal, it undermined claims that technical requirements alone dictated the choice.

As I noted above, all historical writing is ultimately normative, involving ethical judgments about human choices. Making such judgments always assumes, at least implicitly, comparisons with alternative, possible worlds. Brown asks, for example, if Eads made the right decision when he chose steel over iron for his bridge, and he also wonders if the city of St. Louis made the right decision in supporting the Eads Bridge over the more conservative competing design. This assessment requires historians to imagine themselves in the worlds of the historical actors, worlds that no longer exist, and to imagine the viability of choices that in fact were not taken, but could have been.

But making ethical judgments requires a more fundamental standpoint, a conception of what an ideal world would look like. Such a conception is present even when historians judge a period of study against its own past. When historians of technology judge the past in this way, they often tell a story of progress, even when taking negative consequences into account. For example, the metal airplanes of the late 1930s were safer and more cost effective than the wooden airplane of the previous decade. Likewise, automobiles of the early 1960s were far safer than models from the 1930s. Such historical judgments in effect assess the past in terms of the present (or at least a more recent past). This approach is deceptively realist, looking only at the facts. Yet, by using the present as a standard, the historian implicitly chooses among a set of possible worlds, of which the present is only one. Such an ethical standpoint is inherently conservative, in the sense it posits the present order as the ideal, the "best of all possible worlds," superior to all alternatives, at least in terms of its technology.

But a critical history of technology, one that accepts the existence of human choice and alternative paths, cannot rest on such Panglossian assumptions about the benefits of progress. To capture contingency, the historian has to imagine possible worlds where alternative paths can exist. Both the choices made and unmade need to be judged against the standard of an ideal world that is not our world. Such a world is, by definition, a utopia. In other words, the history of technology, if it is to transcend the ideology of progress, is inherently utopian.

The question of auto safety in the mid-1960s provides a good example. When Ralph Nader published *Unsafe at Any Speed* in 1965, the industry correctly pointed out that Nader dismissed the substantial increases in automobile safety over the previous several decades, especially as measured in terms of deaths per miles traveled. (Nevertheless, deaths per capita continued to rise because American were driving more.) Yet the industry's arguments missed the

point of Nader's critique, a point Nader shared with other critics of auto safety of his time. Nader insisted that the correct comparison was not with the automobile's past but the possibilities inherent in the science and technology of the present. Nader showed, largely by examining alternative paths in auto safety research, that vast improvements in auto safety were possible. Nader, in effect, compared the automobile of his day against a possible world in which safety was not subordinated to profit. This was Nader's utopia, and he used it to demonstrate the immorality of the automobile industry's approach to safety.

In his *Ideology and Utopia*, Karl Mannheim (1954) made a useful distinction between ideologies and utopias. Both, he argued, posit states of affairs that go beyond the existing order. However, Mannheim defined utopias as forms of thought that "tend to shatter" the existing order. Ideologies, in contrast, lend support to the existing order, even though their ideals are not realized in this order. Religious concepts of paradise, for example, can serve as an ideology in this sense, convincing people to defer their desires to the afterworld, thus sustaining the existing power structure.

One can translate Mannheim's distinction between ideology and utopia into the counterfactual worlds used in making ethical judgments about technology. In recent work I've posted online (Schatzberg 2012), I contrast two distinct visions of technology, the instrumental view and the cultural view. In the instrumental view, technologies are means to ends, and the ideal technology is the best possible means to achieve a given end. In the cultural view, technologies are a creative expression of human values. In the instrumental approach, ends are divorced from means, while in the cultural approach, means and ends are inseparable. Although both the instrumental and cultural approaches are essential for understanding the history of technology, they draw on radically different visions for their moral judgments. The instrumental vision mirrors the fantasies of Frederick W. Taylor, positing a world where absolute efficiency rules as the ultimate human value. The cultural view, in contrast, admits of many incompatible utopias, but they all subordinate efficiency to human values.

In Mannheim's terms, the instrumental vision is ideological and the cultural vision is utopian. The instrumental vision lends support to the established order by making the argument about means rather than ends, by making efficiency an absolute good rather than asking, "efficient for whom?" This instrumental vision is, I believe, at the root of the ideology of technological progress so long decried by historians of technology.

These broader conceptions of technology can themselves be examined using alternative paths. The instrumental view has long been the dominant path, ever since the concept of applied science displaced older notions of the mechanical arts in the 19th century. When the present-day English-language concept of technology first emerged in the early 20th century, it already embodied this tension between the instrumental and cultural approaches. This tension first

emerged in the German debate over *Technik* and *Kultur*, a debate that became especially lively in the Weimar era. Influential German social scientists like Max Weber embraced an instrumental conception of technology that was transferred into American social theory by scholars like Talcott Parsons. In contrast, Werner Sombart explicitly defined technology (*Technik*) as part of culture, and his views were echoed most importantly by Lewis Mumford. Mumford's *Technics and Civilization* was explicitly utopian, using history to argue for his vision of technology governed not by the ideals of "material conquest, wealth, and power" but rather "life, culture, and expression." In Mumford's utopia, "the machine ... will fall back into its proper place: our servant, not our tyrant" (Mumford 1934, 427). Most historians squirm when reading the final, utopian chapter of Mumford's *Technology and Civilization*. Nevertheless, his vision, which conceives of technology as cultural expression rather than instrumental reason, remains essential if we wish to understand the human choices at the heart of the history of technology.

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