

Cultures and Countercultures of Technology

Before there was thinking, there was making. Before *homo sapiens* developed the learned and elaborated systems of collective representations that today we call “culture,” there were complex toolkits, surviving in the archeological record, enabling early hominids to hunt animals, build fires and cook food, erect simple structures, and reshape their material environment. Although archeologists frequently call these complex toolkits “technologies,” the word itself did not exist before the Industrial Revolution. Earlier societies, going back to Athens and before, had a discourse of *téchnē*, but before 1612 this was never joined with *logos*, learned authority represented by written language. In the High Renaissance, an extraordinary figure such as Leonardo da Vinci might create both classic paintings and ingenious machinery such as a flying device (Figure 0.1). But in a technological age, focusing on the so-called “STEM” (Science, Technology, Engineering, and Mathematics) disciplines, such Renaissance men and women are much rarer.

Prior to the Industrial Revolution, there was a social gulf between the practical arts of toolmakers and rude mechanicals on the one hand, and the fine arts and philosophy of educated gentlemen and ladies on the other. Although Thomas Jefferson might experiment with clever furniture or an early copying machine (the “polygraph,” a mechanical device for tracing handwriting), his social status had less to do with such practicalities as botany or animal husbandry and more to do with his lineage going back to the Randolphs, the Jeffersons, and other early settlers of the colony. Even well into the nineteenth century there were questions as to whether the “agricultural and industrial classes” should be admitted to elite academies. This social divide, existing for millennia, has been no less definitive of technology than the materials and purposes from which it is constructed.

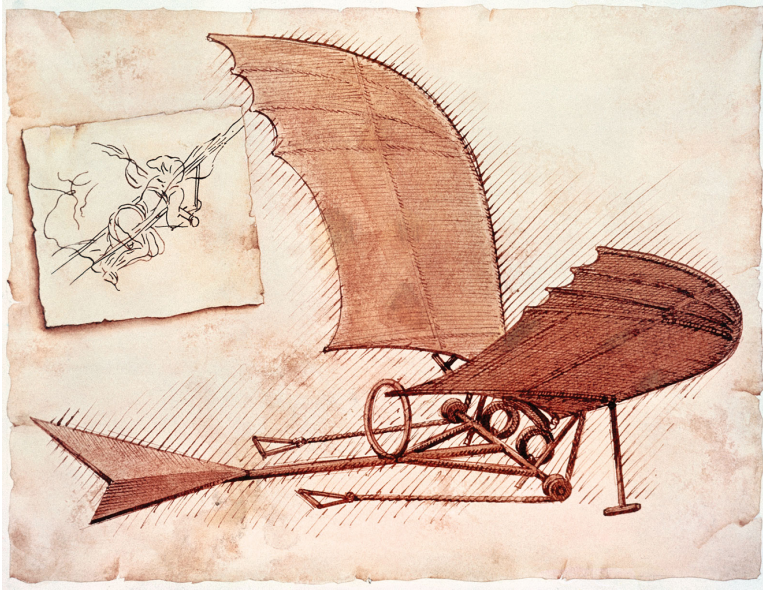


Figure 0.1. Leonardo da Vinci, Flying Machine (c. 1488). Wikimedia Commons, public domain.

How do we think about technology? In the twentieth and twenty-first centuries, there has been a vast explosion of literature describing, celebrating, questioning, and at times condemning technology. Most of the discourses of technology, we can discover, are motivated less by the practicalities of tools and other useful implements, and more by the social and political positions and purposes of the authors. These purposes range from celebrating the triumph of the nation-state, through the conquest of space, to romantic visions of perfect freedom over the internet, to a condemnation of state power as alien and evil, as embodied by world-destroying weapons. Discourses of technology link “technology” with “progress” and typically see technology as a means by which humanity can transcend its current condition. The multiple discourses of technology differ on some fundamental questions: Who leads this transcendence? How is it accomplished? What sort of good does it represent? And most importantly, what sort of narrative does this progress embody? Is the narrative of technological progress a story of man’s attaining godlike perfection (Noble 1997), or is it a Faustian bargain? Is it available to all, or concentrated in core regions of the

modern world system? Is it a triumph of the everyman, or a remote elite? Is it accomplished with the head or with the hands?

A “standard view” of technology, as critiqued by Bryan Pfaffenberger (1992b), understands technology in purely utilitarian terms as harnessing of the powers of nature toward human ends. This standard view is enshrined in an evolutionary anthropology that sees technological advance as driving institutional development, with values and beliefs (“superstructure”) changing as a consequence (Harris 1968, for example). It acquired state approval and endorsement in the United States when Vannevar Bush, President Franklin Roosevelt’s science advisor, published *Science: The Endless Frontier* (1945), presenting a linear progression from basic science to applied science to technological development as official policy. In this view, the role of the government, as represented by agencies such as the National Science Foundation, is to support basic research (typically in university laboratories), which private industry then turns into useful inventions. Practical inventions that serve state purposes, whether military weapons, surveillance technologies, architectural monuments, or code-breaking, might also be developed under state sponsorship.

Propelling this standard, official view was the decisive role that scientific discovery and technological invention played in World War II, beginning with the use of radar in the Battle of Britain, enabling the Royal Air Force to overcome the numerically superior Luftwaffe, continuing with cracking the German enigma code, and ending, of course, with the dropping of the atomic bombs on Hiroshima and Nagasaki. Technology, for a quarter-century after this, was linked to national advancement, which then set a pattern for the rest of the world to follow. The result of World War II was an unquestioned triumph of good (as represented by democracy) over evil (in the form of fascism), which in subsequent years was replaced by other evils such as communism, hunger, disease, and ignorance, and most recently terrorism. Technology, in this official narrative, finally offered mankind the possibility of escaping from these age-old ills. “Modern technology [provides] effective solutions of the problems that have troubled the human race since its beginning” (Borgmann 1984: 7), although nuclear weapons, perhaps *the* supreme technological achievement of World War II, might call this question, of escaping from age-old ills, into question.

A similar set of technological narratives is told in the corporate world, where competition in marketplaces replaces conflict on battlefields: just as in war, whichever competitor arrives at the marketplace

“the firstest with the mostest” has a decisive advantage, with the firstest referring less to physical presence on the battlefield and more to product innovation in the marketplace, and “mostest” referring to features, performance, and value. Early technological advantages in the marketplace create a “path dependence” that competitors find difficult to overcome. It was in this manner that technologically inferior products such as Microsoft Windows achieved market superiority over more robust and user-friendly rivals such as Apple’s OS-2, and how VHS video recorders overtook the superior Betamax: early numerical preponderance created self-reinforcing cycles where growing numbers of users attracted growing numbers of vendors and developers, whether of pre-recorded tapes or software applications, which in turn attracted growing numbers of users. Social acceptance is now recognized as a critical component of technological success, and the dream of every innovator is that his clever new device or idea “go viral” and be propagated through social media.

Propelling these dreams is an enthusiastic view of technology that has taken root in the last 30 or 40 years. Earlier technological enthusiasms, such as personal aircraft that could be parked outside one’s suburban home, or wearable communication devices, were generally the substance of nerdy fascination that were found only in the pages of *Popular Mechanics*. In the current century, however, an inflection point has been reached, and such enthusiasms spilled over into broader discussions of technological utopias: package delivery via drones, regional commutes via pneumatic tubes, driverless cars, or internet displays on one’s eyeglasses—all are now the objects of serious investment and promotion, and search for justification and social status. This excited, the futuristic narrative of technology is perhaps today the dominant narrative.

In the background, for well over a century, has been a dystopian narrative, whether exemplified by George Orwell’s *1984* (1949) (with its accent on propaganda and surveillance), Margaret Atwood’s *MaddAddam Trilogy* (2004, 2009, 2013) (describing a future where genetic engineering has created new versions of humanity), or Stanley Kubrick’s *Dr. Strangelove* (1964), a film about a mad scientist in love with the destruction of humanity. These stories present a dark future in which technological devices vaguely threaten humanity, although the threat is sufficiently ill-defined that responding to it is difficult. Multiple nineteenth-century literary strains, including Romanticism (exemplified by Mary Shelley’s *Frankenstein* [1818]), Nihilism, and the Gothic (for example, *The Matrix* series [Lana and Lilly Wachowski,

1999, 2003, 2003, 2021], in which technology practically obliterates distinctions between “real” and “virtual”) interweave in these dystopian accounts. The 70 years since the publication of *1984* have largely borne out Orwell’s narrative, only with improved technology: surveillance devices that are carried in one’s pocket, and the Ministry of Truth both on network TV and internet newsfeeds and in proliferating conspiracy theories with a global reach. On the surface, these narratives present a story of technology-out-of-control and mad scientists out to reshape the world. Beneath this surface is a Romantic vision of the perfect freedom that technology affords society, marked by an absence of the restraints of time, space, authority, and sociality.

A more down-to-earth story of technology is told when engineers set down their shovels and slide rules, and pick up their pens, describing from first-person experience what it means to design, build, operate, and maintain complex systems (Florman 1976; Petroski 1985, for example). These systems always embody a wealth of tacit knowledge, which *by definition* cannot be articulated: “Here, let me show you,” a message combining embodiment and direct interpersonal engagement, is frequently a technique of engineering communication. The *embodied* character of technology, the manner in which it is comprehended as much through the hands as through logical constructions, contrasts with more academic accounts in which technology is elevated to an academic abstraction.

The discursive context of these narratives is the changing social status of builders and artisans and inventors over millennia in different civilizations. In earlier civilizations, builders were often buried with their tools; on feast days in the Middle Ages, guildsmen would parade with their tools. Going as far back to the Egyptians, where unnamed artisans were revered, and to the Greeks, where Athenian gentlemen disdained the useful arts (favoring instead the liberal arts of grammar, rhetoric, logic, arithmetic, geometry, music, and astronomy), those who design and build useful devices have nearly always occupied a lower rung on the social ladder than those who commissioned them. James Watt, who perfected the steam engine over earlier efforts by Thomas Savery and Thomas Newcomen, was the son of a watchmaker. Henry Ford, arguably the founder of the American middle class, was the son of Belgian and Irish immigrants, lacking social status, a nobody, really, until his Highland Park Assembly Plant, with its innovative methods in production and industrial relations, made manufacturing a foundation for broad prosperity. With the exception of architects such as the Roman Vitruvius, whose imperial patrons and monumental achievements

guaranteed them an elevated status, engineers have nearly always occupied a lower social rank than other learned professionals. This social gulf between technicians and learned professionals, each comprising separate communities, is no less determinative of the character of technological devices than the more explicit statements of “user requirements” that accompany every technological innovation.

Behind each of these narratives is a cosmology, a set of assumptions about what counts for technology and how we go about understanding it. In the futuristic view, the emphasis is on disruption, which is a “good thing”: disruption propels progress. Stable objects and implements, such as cooking pots and dinner utensils, even if they might embody some of the characteristics typically associated with technology, including usefulness, standardization, engineered materials, and assemblage, are not considered technology from this point of view, unless one includes everything human-made as “technology.”¹ The dystopian view also emphasizes disruption, but in a negative light, as an upsetting of settled social arrangements. The engineering view, by contrast, emphasizes practicality and problem-solving, leaving the definition of “problem”—whether hunger or illness or the width of a tunnel-bore—uninterrogated. By contrast, the “social construction of technology” sees problems, social groups, and technological artifacts as always mutually constitutive.

Every culture includes a central narrative and a small number of root metaphors. The central narrative is the story we tell about ourselves, perhaps existing in several versions but always telling the same story either of heroic accomplishment or tragic fate (or more interestingly, some combination of both). The heroic accomplishments of David Lilienthal’s “dreamers with shovels” are similarly presented in Henry Petroski’s *Engineers of Dreams* (1995) or popular accounts. Other stories, such as that of the “brilliant invention” (xerography, for example) or the “mad scientist” (*Frankenstein*), draw on other sets of archetypes and central characters such as the heroic pioneer. The central narrative of American culture is carving a New World out of the wilderness, a narrative that confines to a minor key tragic stories such as the fate of indigenous and enslaved peoples, whose dispossession and forced labor built the New World. Other cultures tell other stories, whether the French “City of Light,” Paris, bringing enlightenment to the world, or China’s Middle Kingdom as the source of harmony between Heaven and Earth, or Rome, the “Eternal City,” the foundation of civilization. These narratives are a core part of the *cosmology* of their culture, a statement about “who we are” and where we fit into the universe.

Cultures are based on root metaphors, vivid images presented either in figurative language or compelling visual representations that condense centuries of meaning into a singular compelling image. In America, the pioneer is such a root metaphor, heroically conquering savage tribes and civilizing the wilderness: despite the closing of the frontier more than a century ago, this narrative has more than a bit part even in contemporary politics, with national candidates bragging about their Wild West roots, and a new cabinet member, Secretary of the Interior Ryan Zinke, in 2017, riding into Washington, DC, on his horse. “Patriots” in period costume, resisting the tyranny of an “alien” ruler, play a part even in twenty-first-century American politics. In France, the heroic narrative of Marianne at the barricades, defying tyranny, has been reenacted many times since 1789, most recently in the *Mouvement des Gilets Jaunes* (yellow vests movement). In Mexico, by contrast, the tragic narrative of *Los Niños Héroes* (the Little Heroes), cadets resisting the American invasion in 1912, is memorialized in a monument in Mexico City, and captures a sentiment felt by Mexicans in every decade since.

Cultures, in other words, are not so much “mental models” as they are shared stories and images and experiences, whether of witnessing a compelling image or reenacting a heroic role. This *shared* quality makes these experiences and retellings the basis of kinship, a fellow-feeling and common identity that goes beyond the particularities of time and place. When this sharedness breaks down, the sense that we have anything in common breaks down. America today presents us with the profound irony of a nation on the cutting edge of technological innovation that nevertheless embraces some of the strongest voices opposed to scientific findings, whether climate science, evolution, or medicine. As I will elaborate in Chapter 3, Section 4 (“The Constitution of Ignorance”), this is less paradoxical once one understands that technological devices augment only certain human capabilities (counting and tabulating, for a primitive example) at the expense of other capabilities such as creativity and artistic expression or collective effort that do not lend themselves to simple technological solutions. An excessive, naïve enthrallment with technology has the unintended consequence of leaving societies *less* capable of confronting unexpected events, whether pandemics or climate catastrophes. Other examples of challenges where technology has failed will be developed in Chapter 3.

It is my thesis that this excessive focus on technology, at the expense of other areas of human interest, poses unique challenges for the common good. Establishing what we as a society have *in common*

and how this connects us one to another is a central question for the *social sciences*, yet one that is frequently lost in an individualistic society. To develop this, I will examine the interplay between private goods and privatization, on the one hand, and collective goods—public goods, club goods, and common pool resources—on the other. Building on Elinor Ostrom’s *Governing the Commons* (1990), I will demonstrate that “the commons” (a shorthand for collective goods and values, potentially embracing not simply open spaces like parks and public squares, but also intangible resources such as identities and attention), like private goods, always has a foundation in the tools, architecture, and instrumentalities of civilizations. Different civilizations have radically different understandings of what their members share, whether the open fields of preindustrial England, the *agora* of the Athenians, the language of l’Académie Française, or the imagined community of the nation-state. David Bollier and Silke Helfrich, in *The Wealth of the Commons* (2012), present multiple examples of “commoning,” the embrace of common goods. In contemporary discourse “the commons” is both a concept and a trope, both a designation of certain types of goods and different types of values, and it is also a figure of speech for what the members of collectivities *share*, whether spaces or identities. The act (or imagination) of sharing creates a sense of kinship, and the homology of “kin and kind” suggests a basic foundation of society. The overvaluation of private goods for the past 250 years, going back to Adam Smith’s *The Wealth of Nations* in 1776 (Smith 1970), has blinded societies and governments to the centrality of what they have *in common*, including public goods and common pool resources.

Examining these issues through an anthropological lens, taking into account the full range of humanity and the role of culture in defining both humanity and human variation, is central to my thesis. Culture, in the standard anthropological formulation, is understood as a learned system of shared understandings, although technology often adds complexity to cultural simplicity. The *shared* aspect of cultures is central to defining what human groups *have in common*, and hence a shared sense of the good. The “common good” is a cultural formation, different in every tribe, village, and nation.

To develop this viewpoint, I will first examine the subsistence patterns of societies lacking in “technology” as contemporarily understood (Chapter 1), noting that these societies, while often having sophisticated tools, nevertheless did not fetishize them as “technology.” In Chapter 2, I will examine the emergence of private goods and the eclipse of the common good consequent to multiple developments creating the mod-

ern era, including European expansion, the Industrial Revolution, the rise of the factory system, and the rise of liberal economics as reflected in Adam Smith's *The Wealth of Nations*. In Chapter 3, I will examine the interplay of technology and shared goods, whether common pool resources, public goods, club goods, or toll goods. Drawing on Elinor Ostrom's *Governing the Commons*, I will describe how critical features of technology, including independence of locality, scalability, and translation and compression of energy and information, pose challenges to some of the aspects of commons governance, including "gate-keeping" and "monitoring."

Chapter 4 will examine some of the newer commons emerging in a technological society, including the radio frequency (RF) spectrum, airspace, and branding, a commons that did not exist before the twentieth century. Chapter 5, "Public Goods and Institutions in Cyberspace" (also a commons that was only recently invented) examines attention and desire as a new commons. Beginning in the seventeenth century, the commons, the fields that villagers shared, were enclosed (as described further in Chapter 2); today, the commons of shared public spaces, shared identities, and shared aspirations are fragmented by technology. The new enclosures of advertising and social media undermine the common good, splintering the nation into market segments and tribal attachments. The increasing tribalism of American culture is adequate testimony to this. "Democratic Vistas" (Chapter 6) considers the different "-scapes" (not only landscapes but also ethnoscapescapes, mediascapescapes, and technoscapescapes) that define a democratic society, while Chapter 7 examines several case studies in the successful governance of technologically created commons, including the high seas, airspace, and the global circulation of capital. My conclusion, "Reclaiming the Commons," builds on the idea of reclamation as an appropriate management strategy not only for worn-out lands, but also for worn-out institutions.

Cultures are not limited to national cultures; they can include cultures of the arts, of industries, or of technology. The importance of cultures of technology is that they frame the questions of institution-building: they outline the possibilities (including some options and excluding others) for bounding and legitimating institutional power and identity, and focus attention on a few central questions. In the "endless frontier" narrative, for example, institution-building means funding research and training, and then getting out of the way, allowing the scientists and engineers to build a better tomorrow. In the dystopian, "mad scientist" narrative, technological expertise must be kept in

check by institutional authority. In the “innovation imperative” narrative, the hero-entrepreneur assembles new devices with new routines of work and leisure to create a durable business. Other prudent steps that might not fit into the narrative, whether a fact-based assessment of a technology’s capabilities and limitations and its long-term sustainability, or a reflection on its ultimate purposes, are passed over: in the mid-1990s, as America was on the verge of a technological upheaval, Congress eliminated the Office of Technology Assessment, because its fact-based, technocratic assessments were incompatible with the triumphant narrative of heroic technology. The cultures of technology, that is, the shared narratives about what technology is for and where it should go, frame the vectors of technological development in a more fundamental way than either the laws of physics or statements of “user requirements”: in the twentieth century, multiple nations sought to overcome the law of gravity, whether through the German V-2 rockets raining down on London or the space race between the United States and the Soviet Union.

It is generally accepted that technology is *socially constructed*, that it constitutes a human project rather than a deterministic unfolding of the laws of nature. “social construction,” however, begs the question of what sort of project technology presents, its unique character, and its ultimate purposes. The cultures of technology outlined here present contrasting answers to these questions, particularly the question of ultimate purposes. Both the official view, as represented by the “endless frontier,” and the dystopian view are in agreement that the ultimate result of technology is to advance the power of the state; they only differ in whether or not that is a good thing. The dystopian view presents a nihilistic understanding of the state as fundamentally evil, and technology as the instrument for accomplishing that ill will. By contrast, both corporate and enthusiastic views adopt a utilitarian perspective, seeing technology as creating more leisure, abundance, and enjoyment, where leisure and abundance are assumed to be ultimate goods. As I will demonstrate in Chapter 2, utilitarianism represents intellectual laziness, a retreat from the stubborn facts of cultural variety that were being discovered around the world in the seventeenth and eighteenth centuries: Finding differing beliefs about the good in Africa, Asia, and Latin America, European philosophers created a version of the good that everyone could agree upon: individual enjoyment.

In contrast to all of these views, the culture of technology of those who actually design, build, operate, and maintain the devices is far more pragmatic: “are we accomplishing our goals?” Most engineers are

conscientious professionals, yet in their professional capacity they are not expected to question the ultimate purposes of their devices. Such questions are more typically dismissed as “philosophy.”

With all of these differences in how to make sense of technology, there is nonetheless an overall consensus that “technology” is removed from public negotiation. In the design and construction of a technological device, certain imperatives must be met. Some of these, called “user requirements,” are negotiable; other imperatives, such as the stresses that can be borne by connecting structures of a bridge or the storage capacity of a memory chip, are not. Just as we cannot vote on the laws of thermodynamics, so too such technological issues as the geometry of a structural member or the memory requirements of a desktop computer are beyond popular negotiation. In resolving such issues, the arbiters are the engineers who design and build the bridges and boxes, and not the public that buys them. In sum, all of these cultures present technology as a force or entity disengaged from the social realm, a beneficent (or maleficent) force beyond negotiation that can only be handled by a technological elite: the engineers.

Technology, as a named class of cultural objects and as a subset of the universe of useful things, is an instrument of state formations: state authority is required to create the standards and other autonomous representations needed to turn local tools into broadly accepted toolkits. As I will elaborate on in Chapter 2 (“Goods, and the Common Good, in a Liberal Society”), the term “technology” should be properly restricted to artifacts of the modern era, inasmuch as the term itself was coined only in the seventeenth century to describe the emerging instrumentalities of the Industrial Revolution: applying the term “technology” to preindustrial toolkits, while at times a convenient archeological shorthand, is in fact an ethnocentric imposition of numerous assumptions onto cultures and societies where they demonstrably do not fit. An interrogation of technology is as much an interrogation of state authority and purposes as it is an interrogation of form and function, and the discourse of statecraft, including coalition-building and authority-formation, is present, even if *sotto voce*, in all discourses of technology.

But, as presented here, these multiple discourses of technology and the commons cannot all be right: when is technology beneficial or malevolent, when is it something that can be controlled, or something out of control, something that brings people together or divides them, something that liberates or enslaves humanity? Whether the commons is shared by all members of a community (and what that commons is), or is a resource for the strong to prey on the weak, are pressing ques-

tions as technology races forward, creating new commons and erasing the old. Resolving issues such as these, or at least suggesting a new discourse in which they can meet, a more complex narrative within which the many parties interested in technology can agree to disagree, is the objective of this book.

Note

1. “Fernand Braudel has written that ‘[in] a way, everything is technology’” (Adams 1996: 11). This proclivity to universalize what I hope to demonstrate is a time- and place-bound cultural practice, culturally derived and culturally bound, is contrary to the spirit of social anthropology: the very definition of ethnocentrism. The *place*, as I shall discuss in my first two chapters, is less a geodetic space, bounded with lines on a globe, and more a topological and semantic space, bounded by a dominant discourse unique to the modern world. Although many technological systems ramify around the world, most conceptions of what is and is not technology have an identifiable structure. Cultures assign meaning to the artifacts and practices that we call “technology,” and then act on it accordingly.