**Introduction**

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“The times they are a-changin’.”  
Bob Dylan

Printing, the steam engine, electricity, aircraft, ICT, genomics—these kinds of revolutionary technologies are profoundly changing, or have changed, the time-order of society. The Internet and e-mail, for example, have significantly contributed to the contemporary compression of time (and space). DNA tests, to mention another example, draw both the future (in predictive medicine) and the past (in legal verdicts) into the present. These technologically mediated practices induce, to paraphrase Martin Heidegger, new ways of “being-in-time,” new time-orderings, and new patterns of cultural meaning.\(^1\) Indeed, the times they are a-changin’—and technology plays a crucial role in this. But how, what, where, and when? And what are the cultural, social, and political consequences of these changes? This is the central topic of this special issue: the political implications of technological developments in terms of the changing perceptions and institutionalizations of time. In short: the time-politics of technology.

**Coproduction**

Nowadays, it is a commonplace to say that science and technology play a decisive role in our society. It is generally held that we live in a “knowledge society” or a “technological culture.” Scien-

\(^1\) Martin Heidegger, *Sein und Zeit* [1927] (Tübingen: Niemeyer, 1977).
Scientific knowledge and technological artifacts have become part and parcel of our way of life. Social cohesion, for example, requires a properly functioning electrical network; citizenship in present-day media democracies hinges heavily on television and other communication techniques; developments in biomedical sciences and technologies are constitutive of the way we conceptualize health and disease, or even life and death. Science and technology are not to be understood as neutral instruments by means of which autonomous human beings shape their personal and common lives; rather, it is precisely the reverse: human beings and societies change in conjunction with revolutionary innovations. In other words, scientific and technological developments affect what human beings are and how we conceptualize humanity and the good life. Science and technology, as "ways of worldmaking," act upon not only the means but also the ends of action.

In contemporary science and technology studies, this basic idea is phrased as the coproduction (also coevolution or coconstruction) of science, technology, and society. By using the concept of coproduction, two widespread but misleading modes of thinking are avoided, namely, technological determinism and humanistic voluntarism. In the former, the acting and doing of human beings are thought to be determined and limited by science and technology; in the latter, human beings are considered to be the measure of all things, and thus to be able to master science and technology. In contrast to these two modes of thinking, the idea of coproduction is based on the assumption that technology and society evolve in conjunction and are mutually dependent. They constitute each other in a reciprocal movement. Science, technology, and society are "internally related," to paraphrase Ludwig Wittgenstein.

The concept of coproduction has far-reaching implications in conceptualizing the ethical and social components of science and technology. In traditional views of technology, it was assumed that these components showed up only when scientific knowledge and technological artifacts became implemented and applied. Science and technology studies have convincingly demonstrated, however,

that knowledge and technological designs incorporate from the very beginning new forms of social order: new practices, new patterns of action, new networks of human and nonhuman entities, of meanings, references, and referees. Reflection on the moralities and sociabilities embodied in science and technology therefore requires early anticipation of these possible new worlds, including perceptions of nature and culture, definitions of health and disease, ideas about fate and free will, and the consequences of these new worlds for the distribution of responsibilities and patterns of in- and exclusion.

In contemporary social theory and philosophy, modern technological or knowledge societies are conceptualized along two axes of social coordination: the first stresses orderings in time, the second stresses orderings in space. It is widely accepted that orderings in time and space have significantly changed in the last decades as a consequence or part of globalization processes, among other reasons. Sociologists speak of “time-space distanitation” (time and space having become disconnected) and “time-space compression” (the condensation of time and space). In contemporary debates on globalization, however, attention is paid predominantly to space, and only slightly to time. Issues that gather attention include the decrease in distances, the increase of scale, the separation of geographical place and cultural space, the global aspects of the local, and the local engagements of the global. Compared to this, the new orderings of time—at both the individual and the social level—are theoretically and empirically underrepresented. This special issue will jump into this gap by concentrating on the time axis.

Time and Technology

Insofar as the relation between technology and time has been studied, especially within the multidisciplinary (and rather fragmented) field of time-theory and research, at least two lines of reasoning can be discerned. The first claims that new technologies produce new time constellations in which a particular time prevails; the second argues that new technologies add new temporal structures to the already existing plurality of times. The two lines of thought are not necessarily conflicting; hence, both of them resonate in the contributions to this special issue, though the latter (about plurality) more loudly than the first (about singular dominance).


An example of the first way of thinking is Zygmunt Bauman’s analysis of the shift from “heavy modernity” (the era of heavy machines, trains, airplanes, and the *Titanic*) to “light” or “liquid modernity” (the era of light and fast ways of traveling, communicating, producing, and managing labor, made possible by technologies like portable computers, cellular telephones, e-mail, and the Internet). The time constellation of heavy modernity is dominated by a linear time conception, whereas light modernity is governed by the concept of instantaneity (an “immediate,” “on-the-spot” fulfillment).

In line with the second mode of thinking, authors like Barbara Adam and Helga Nowotny emphasize the further proliferation of various time regimes due to new scientific insights and technological developments. They highlight the plurality of heterogeneous times, such as social time, personal time, natural time, physical time, biological time, and evolutionary time. The plurality of heterogeneous times manifests itself both at the level of individual actions and perceptions and at collective and institutional levels.

Each temporality within the plurality of times has its own logic and scale—“proper time,” or *Eigenzeit*, as it is called, paraphrasing relativity theory. Therefore, plural times cannot always be reduced to one and the same definition of time, such as clock time. On the contrary, different time regimes often are at odds with each other, and thus have to be coordinated, accommodated, or orchestrated—again both individually, within a person’s lifestyle and trajectory, and collectively, by devising cultural meanings and institutional regulations. Organizing actions and choices in time—one of the key mechanisms of social ordering—is therefore not only a matter of “timing” (doing the right thing at the right moment, thus assuming

9. To explain *Eigenzeit* in relativity theory, Fraser gives the example of an Indian elephant and a house mouse, which mate and deliver on the same date: The elephant’s gestation period is 645 days, the mouse’s 19 days. The mouse goes on a trip at very high velocities and returns just in time to deliver simultaneously with the elephant. The temporal separation between the two events (conception and delivery) was 15,480 hours in the elephant’s proper time, 456 hours in the proper time of the mouse. Fraser concludes: “Time, so to say, is the set; proper times are the members of the set” (Julius T. Fraser, in Nowotny, *Time*: [above, n. 8], pp. 2–4). Nowotny here extends the idea of proper times to the study of social processes, showing that individuals and societies have different judgments about the role and importance of their own and of other people’s and groups’ times.
Orchestrating time by timing and tuning is the more relevant since one and the same technology, such as genomics, can induce a variety of temporal conceptions and regimes. Within (social) theories of time, science and technology are often connected either to modernism and clock time (Newtonian physics, industrial society, machines and mechanization, Taylorism—to mention some keywords), or to postmodernism and the speeding up or even imploding of time (focusing on “the contemporary,” “the now,” and “the present”—a kind of “momentocentrism,” facilitated by new communication technologies like the Internet, e-mail, and mobile telephones). This distinction echoes Bauman’s heavy and light modernity. But both conceptions of time are challenged, especially within environmentalism (“green thinking”): the modernist’s artificial, abstract, and disciplining clock time is opposed by natural time, and the postmodernist’s “instantaneous time” by the longue durée of evolutionary or even glacial time. Remarkably enough, genomics, both as scientific theory and as technological practice, seems to incorporate elements of all three: the modernist tendency toward linearity, causality, and control (genetic engineering), the postmodernist love for the here and now (folding past and future into the present), and the naturalist obeisance for the time of nature (evolution and the Book of Life). Thus, genomics breaches the boundaries between nature, technology, and culture, encompassing their different and often incommensurable time scales and conceptions. All the more reason to put orchestrating processes like timing and tuning on the research agenda. How do the divergent temporal qualities of new technologies go together? How are such temporal factors coped with in daily practice?

What is more, the results of these orchestration processes cannot be expected to be uniform. On the contrary, each person, each group (professionals, for example), each institution, and each culture will coordinate the heterogeneity of times in its own way, thereby producing a plurality of time-constellations—proper times on a meta-level, so to speak.

To deal with these issues, we have formulated a series of research questions about the time-politics of technology:

- What are technologically mediated constructions of heterogeneous time, and how do they operate?
- How are these different times reconnected or orchestrated in different settings?
• What relation exists among different orchestrations: dominance, hegemony, and/or peaceful coexistence, pacification? In other words:

• Which new kinds of “being-in-time” are induced by new technologies; how are they related to more familiar time regimes and conceptions; and who and what is included or excluded?

• Last but not least, how should such questions be conceptualized and analyzed?

Contributions

The contributions to this special issue deal with different aspects of the time-politics of technology. Nik Brown comments on the sociologies of temporality and expectations in exploring the dynamic relationships between the various presents and futures in the biosciences. He discusses the role of hope in three distantly related contexts: the marketing of green biotechnology, biobanking in the medical domain, and clinical techniques for mobilizing hope as a calculative therapeutic object in cancer care. He critically appraises the suggestion that temporality is being consumed by the present (so-called momentocentrism) and instead explores the dependence of the present on regimes of hope and futurity. Future values work retroactively on present matters of fact. In this sense, the future is folded into the present. Regimes of hope and truth, values and facts, are interarticulated in ongoing reassessments of what is known and what is expected—creating permanently shifting tenses. So, Brown argues, it is impossible to make a clear-cut distinction between hype and reality. On the contrary, the future is performatively made real in the present.

Reconstructing the Dutch parliamentary debates about DNA-induced changes in criminal law, in particular the extension or even entire abolition of periods of limitation, Hans Harbers analyzes the time-politics of genetic techniques in legal contexts. DNA evidence, more than ever, makes it possible to fold the past into the present by reopening old cases and solving cold cases. Dutch parliamentarians unanimously embraced this as technical progress in legal proceedings, showing an astonishing ignorance of time-related normativities embodied by these techniques. Time-honored notions about forgiving and forgetting, legally articulated in the principle of finality and institutionalized in statutes of limitation, have given way to lifelong pursuit and revenge, keeping the past omnipresent. But, Harbers asks, how much time can we stand? And do we want the
past to continue in the present? At what point does the folding of time turn into a burden of time? Such questions can be dealt with only if we first acknowledge and seriously face up to the time-politics of technology.

Harbers argues that, if we want to detect and discuss the politics of technology, sometimes we are better off if we regard facts and artifacts as black boxes not to be opened by going back to the construction process in the laboratory. Taking an opposing tack, Mike Michael, Steven Wainwright, and Clare Williams delve into the laboratory, exploring the multiple layered temporalities in the accounts of stem cell scientists concerning the future trajectories of their research. Using Hans-Jörg Rheinberger’s notions of “epistemic things” and “technical objects,” they not only consider concrete, transparent and well-articulated futures, as is usual in most of the sociological literature on future expectations, but they also pay attention to vague, opaque, and immanent futures. In making this maneuver, they try to avoid Rheinberger’s exclusive orientation toward the epistemic—that is, the temporalities entailed in the experimental process. Using Aristotle’s notion of “phronesis,” they extend their temporal analysis to other, interrelated substantial levels: namely, the ethical and the political-institutional ones. By conceptualizing human embryonic stem cells as “phronesic things,” the epistemic-ethical-political futures of stem cells can be grasped more adequately—in terms of both the immanence and the heterogeneity of futures.

Peter Peters arrives at the central theme of this special issue, the time-politics of technology, not by starting from a particular technique or a technological artifact, but by analyzing a daily practice: traveling. Time and speed are important elements in daily practices of travel. Peters criticizes the argument of mainstream transportation research and politics of mobility, that the time spent traveling can be reduced to a neutral and measured unity and saved by speeding up: such a reduction of travel time to clock time misses important points about traveling that are relevant to the alternative politics of mobility. In his presentation of two transit practices, international air travel and urban traffic, Peters treats traveling not as an individual movement from A to B as quickly and smoothly as possible, but as a problem-solving (and creating) social activity. Travel speed, then, is taken to be not a measurable relation between decontextualized space and time, but the outcome of spatiotemporal orderings, so-called passages. These passages consist of a heterogeneous network of material and immaterial elements; a permanent process of “exchange” between these elements maintains the order
of passages. Travel, Peters concludes, not only takes but also makes time. This situated notion of travel time in terms of passages and exchange enables him to rethink the traditional politics of mobility.

Finally, Marli Huijer analyzes the temporalities introduced by preventive testing and screening technologies for hereditary breast cancer. Starting from Adam’s notion of “timescapes,” referring to temporal landscapes made up of a multitude of rhythms and temporal activities that interact with each other and mutually constitute the whole, she asks: What kind of shifts do those technologies imply for women’s perception and experience of time? How do they accommodate different requirements from different sorts of time? How are different temporalities orchestrated in such a way that they contribute to what is valued as a good or aesthetic life? Huijer concentrates on two mechanisms of orchestration, timing and tuning, and formulates a number of conditions for individuals as well as collectives in order to make proper use of these mechanisms.

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