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JÉRÔME LAMY

Connections - Introduction

No technique emerges, is transmitted or deployed in isolation. Techniques are the combined results of practices, political and economic circumstances, cultural choices, material opportunities, and converging social forces. This interdependency between contingencies and structures results in a multitude of intersections, overlaps, and connections. This section therefore intends to explore the interconnections of techniques and the social fabric. We want to look at these issues on a global scale as practices, uses, objects, and methods in a variety of fields of human activity circulate. In each major field of practice, different types of techniques have emerged from encounters between specific frameworks and the possibilities offered by the wider technological context.

The chapters follow the twists and turns of how a range of techniques variously connected to social structures along the nineteenth and twentieth centuries. In the process, the section explores some of the key global transformations witnessed in these two centuries.

Liliane Hilaire-Pérez's historiographical chapter unpacks the various meanings of the term 'technology'. Initially conceived of in the early modern period and eighteenth century as including all practices in all their diversity, the nineteenth-century concept of technology, particularly in England, became centred on machines. Later a more procedural rationale prevailed where technology as understood not only as machinery but as encompassing all the processes and practices necessary to implement them. In addition to outlining conflicting definitions of the term, Hilaire-Pérez draws attention to the lively, mostly French, research tradition that has considered technology as part of the humanities. This position is both a methodological choice (to capture all forms of human practice) and a heuristic one (to avoid considering technology as an end in itself). This conceptual discussion allows us to foreground 'technique' (rather than 'technology') at the heart of different types of human activity, while the following chapters investigate the main technical developments witnessed in the nineteenth and twentieth centuries.

The laboratory, which has been a special place for experimentation since the beginning of the early modern period, is defined and shaped by various structures and conventions — be they social, epistemological, or political, while being naturally also at the centre of technical questions. Joris Mercelis explores the ways in which laboratories as places specifically devoted to science have integrated technical components (notably through instrumentation) as well as produced new techniques (as, for example, the optical equipment that came out of Fraunhofer's laboratory).

Due to the rise of scientific practices involving a large number of researchers, engineers, and technicians, large-scale organizational procedures and a vast deployment of technologies, a truly Big Science emerged after the Cold War. Olof Hallonsten highlights the many transformations that have affected Big Science since the 1950s, including the development of nuclear and particle physics, the increasingly diverse uses for large particle accelerators, and the emergence of combined instrumental structures.

Spreading beyond laboratories, techniques come into contact with the regulatory frameworks of human activities, starting with that of the law. Legal formats are a good indicator of transformations;

throughout the last two centuries, patents in particular have reflected the development of industrial capitalism as well as the evolution of national and international legislations. Alessandro Nuvolari and Caterina Sganga investigate how the different phases of the industrial revolution were shaped by laws. Starting from a consideration of the co-evolution of techniques and legal frameworks, they analyse the role of patents in the practice of invention during the First Industrial Revolution. Patents then formed part of a system that was not strictly codified by law. In contrast, the Second Industrial Revolution was characterized by the rise of a powerful industrial sector and patents became the norm, including in international regulations. Finally, the Third Industrial Revolution was marked by the emergence of standardization and its framing by law.

One of the reasons technology was so present socially in the nineteenth and twentieth centuries was because it was disseminated via specific educational practices. Stéphane Lembré shows that whatever the particular national context, there was a significant broadening of technological education in Europe — be it in terms of its audience, the areas it covered or the professions involved. He first insists on the increasing diversity of educational spaces with specialized schools emerging as early as the eighteenth century. Economic requirements (particularly in terms of the quality of the workforce), the control of workers, changes in the professional structure, as well as various political agendas, all contributed to recasting technological education.

The question of power and how it is supported by technology is central to understanding the history of armed conflict. Patrice Bret devotes a chapter to the relationship between war and technology. He maps the historiography of what has been a very rich field of research, especially since the 1980s. The relationship between war, power, and technology informs global developments, which are based particularly on innovation, secrecy, and cooperation.

Work was one of the areas most influenced by technological developments in the nineteenth and twentieth centuries, as Patrick Fridenson shows. Modern management developed internationally out of the contributions of different types of actors. Frederick W. Taylor's ideas and methods were initially used on production lines. Aiming to apply science to workshops and, later, offices, Taylor's methods were among the most efficient ways of using skilled workers' know-how and stimulating semiskilled workers' and labourers' productivity. Fridenson demonstrates that they enabled engineers and technicians, who were gathered in special offices, to identify the best worker, the best tool, and the best way to do each task. They were also

part of methods that came from the gun and ammunition sector. Thus, the goal of Taylor's methods was to standardize preparation and micromanage work processes while individualizing wages. From America, Taylorism spread to Europe and Asia thanks to consultants, international conventions, and national institutions. It was also introduced to the Soviet Union by communist leaders and activists, and then implemented more rigidly in Communist China. Taylorism differs from Fordism and Toyotism, although it is at the base of both. Although Taylorism has been at the centre of criticism ever since its introduction, it has proved remarkably resilient. Despite renewed criticism in the 1970s, it has survived to this day with automation, its focus being always to extract knowledge about work processes in order to control the cost of labour and administration. However, even automation cannot eradicate the resurgence of autonomy among the workforce.

For the past two centuries, techniques have been at the centre of many controversies as François Jarrige points out. Different moments can be stressed: first, the rejection of the cult of machinery at the beginning of the nineteenth century; then, with industrialization, the easing off of tensions. Later,

in the twentieth century, came a growing critique of technology in the wake of the condemnation of the consumer society; and more recently, technoscepticism motivated by environmental considerations.

One of the reasons technology has been criticized so harshly is because it is perceived as being conducive to capitalist and destructive changes in living conditions. This confrontation between technology and the future of humankind is at the heart of technological transformations affecting the body, as Cecilia Calheiros points out in her chapter. In the nineteenth century, hygienist policies and germ theory paved the way for biopolitics and its articulation of social anxieties and industrial imperatives. At the same time, eugenics drew on the racist ideological matrix to implement so called regenerative technologies. In the twentieth century, self fashioning techniques as well as sport and fitness manifest the emergence of new demands on individuals. Overcoming biological boundaries prepared the political and ideological sphere for biomedicalization and transhumanism.

The entangled dynamics linking techniques and the body are also central to gender, as Virginie Julliard shows. She identifies three moments in the history of the intersections between gender and technology: the 1970s saw a critique of the underrepresentation of women in the literature; the 1980s corresponded to the rising importance granted to users of technology and the emergence of the subversive figure of the cyborg; and finally, the 1990s and 2000s, which aimed at the deification of the body and the gendered distribution of technological practices (and in particular digital practices). Julliard concludes by thinking about feminist technology as a means to redefine the tenets of patriarchal culture.

Martine Beugnet and Mathieu Duplay explore the foundations of the techniques of audiovisual culture. The reproduction of sound and moving images was the result of social, cultural, political but also sensual and aesthetic transformations. Throughout the nineteenth and twentieth centuries, immersive technologies which represented technological feats were often driven by aesthetics.

In the nineteenth and twentieth centuries, technology started penetrating every aspect of the everyday. Gil Bartholeyns and Manuel Charpy analyse the industrial, commercial, and economic changes that influenced the widespread circulation of technological objects. The objects that accessorize contemporary consumption, from plastic to serial, standardised consumer goods, are also technological objects of sorts.

Soraya Boudia and Nathalie Jas attempt writing a global history of the links between technology and pollution. They note parallels in the development of industry and the spreading of pollution over two centuries. Deconstructing this process, Boudia and Jas analyse the various ways pollution has been managed in history. Depending on time periods and contexts, a variety of resources and tools are deployed from control and monitoring to regulations and law.

If technologies impact the environment and contribute to its destruction, they also sometimes involve recycling and repair. Thierry Bonnot and Michel Letté identify a multiplicity of cycles in the technical treatment of objects and materials. They show, once again, that moral and ethical considerations are part and parcel of practices of recycling and reuse.

The cross-cutting issues addressed in this section of the book aim to help readers grasp the complex issues in play in the globalization of techniques. This is not a question of choosing top-down or bottom-up approaches, but of considering techniques as the combined result of practices, objects, innovations, regulations, cultural tastes, economic choices, and political orientations.