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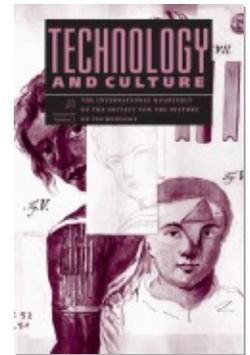
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## Introduction: The Crafting of Medicine in the Early Industrial Age

Christelle Rabier

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## Introduction

### The Crafting of Medicine in the Early Industrial Age

**CHRISTELLE RABIER**

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Current medicine is more or less synonymous with its technologies, from drugs to recording systems. In the past two decades, scholarship in medical sociology and STS has profoundly engaged with the shaping and use of technologies in a medical context and explored the ways by which they redefined medicine. With few exceptions, narratives of medical technologies rarely challenge the invention of the stethoscope as the origin of both technological medicine and technology-driven modern medicine.<sup>1</sup> Focusing on a different time frame, this special issue offers a critical enquiry into the co-construction of medicine and technology in the early industrial age.

The issue's title is meant as a pun, playing on "fitness" as a state of good health and "fit" as the sometimes awkward accommodation between users and technologies. "Fitting for Health" offers four case studies on the materiality and technical elaboration of the medical trades between 1700 and 1900. Responding positively to Arjun Appadurai's invitation to follow the "social life of things" and evaluate how human beings endowed objects with diverse meanings in practice and trade, this special issue investigates

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1. Stanley Joel Reiser, *Medicine and the Reign of Technology* and *Technological Medicine*.

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different commodities, ranging from materials (such as electricity, steel, and *papier mâché*) to devices (trusses, electrical machines, anatomical models, and trade catalogs). We investigate their material configuration, their invention, improvement, and diversification, the sites of their deployment, their status both as novelties and as less spectacular objects of everyday use, and the sum of challenges they faced in fitting themselves into people's lives.<sup>2</sup>

Liliane Hilaire-Pérez and Christelle Rabier uncover the history of steel trusses in eighteenth-century Europe from their manufacture to their retailing, showing how the industry's growth resulted from a combination of active demand, interactions among manufacturing and medical trades, careful selection of material qualities, imaginative marketing, and distribution in Europe and the colonies. François Zanetti analyzes the various and complex ways by which medical electricity became a part of the *materia medica* of late-eighteenth-century Parisian medicine. Anna Maerker discloses how anatomical models, from wax to *papier mâché*, served medical and non-medical purposes and how their authority as depictions of human bodies was renegotiated in response to changing audiences over a century. Looking at medical instrument catalogs not only as information sites about technologies but also as paper-based communication technologies in themselves, Claire Jones argues that the number, shape, and uses of these publications slowly changed over a century, matching and enabling the transformations of economic and social relationships among practitioners, manufacturers, and hospitals.

The set of articles heuristically uses "technology" to analyze how medicine and its material processes were crafted, endowed with meaning, and woven into European societies in the early industrial age. Opening the medical "black box"—circumventing its "transparency" and its tendency to be ignored as a mediating tool—provides a significant common point of entry for our enquiries, triggering further analysis of the relationship between humans and non-humans as shaped in medical knowledge and practice.<sup>3</sup> The very definition of which ailments or treatments could be considered "medical" changed over time. Medical practitioners played a critical role in that respect, both in their theoretical works, and as practical providers of medical care, from which they earned their living. Since antiquity, medicine has provided a model for expert knowledge.<sup>4</sup> Modern theories of technology and their uneven distribution within societies may indeed be linked to Plato's formulation in the dialogue *Protagoras*: the arts and crafts that Prometheus and his brother provided to human beings compensated

2. Arjun Appadurai, ed., *The Social Life of Things*; David Edgerton, *The Shock of the Old*.

3. Edwin T. Layton, "Technology as Knowledge"; Bruno Latour, *Reassembling the Social*; David Edgerton, "Innovation, Technology or History."

4. Christelle Rabier, *Fields of Expertise*, 1–33.

for their deficient nature; but, as Hermes noted, they were distributed “so that there is one doctor or other expert only for a lot of ordinary people.”<sup>5</sup> These “states of knowledge,” however, evolved according to, and in turn contributed to, establishing distinctive political agendas, mediated through legal, social, and economic norms.<sup>6</sup> Accordingly, the focus on technology has encouraged our authors not only to investigate the materiality that grounds medical intelligence, but also, most decisively, the modes in which technological objects were exchanged and used, and thereby endowed with cultural and political meanings and values which were partly determined by competing access to technologies and the agencies of medical technologies’ handlers.

### Medical Crafting: The Medicalization of Technology

No living or inanimate material or product is medical as such: today as in the past, things are endowed with curative properties only through complex chains of manipulation and interpretation that can be analyzed as a process of “medicalization.”<sup>7</sup> “Fitting for health” reveals the social, economic, and cognitive machineries which shaped technologies of the early industrial age as medical.

Commercial distribution and the role of doctors constituted one of the first attempts to analyze the medical branding of technology. Practicing men and women, the early-modern “medical entrepreneurs” as Roy Porter called them, engaged in trade of products, notably that of proprietary medicines.<sup>8</sup> The four articles argue that, in understandings of medical commerce, the term “charlatanism,” widely used following Porter, fails to grasp the complexity of medical practitioners’ engagement in the manufacturing and trading of medical products and services to clients ranging from individual households to public institutions. The diversity of practices went

5. Plato, *Protagoras*, 322c.

6. Sheila Jasanoff, *States of Knowledge*. For a discussion along anthropological lines, see Brendon Swedlow, “Cultural Production of Four States of Knowledge.”

7. Medicalization is not used here as in two former definitions by historians, that is, the density of medical-care suppliers and institutions in a population (Jean-Pierre Goubert, ed., *La médicalisation de la société*), or a nearly teleological process by which medicine was ultimately controlled by the state (Laurence Brockliss and Colin Jones, *The Medical World of Early-Modern France*). Here, we use it to address the processes by which an object or activity become medical; this is similar to its uses in medical sociology: see Peter Conrad, *The Medicalization of Society*. Along the same lines, see Marilyn Nicoud, “Formes et enjeux” and Sandra Cavallo and Tessa Storey, *Healthy Living in Late Renaissance Italy*, conclusion.

8. Roy Porter, *Health for Sale*. See, more recently, Harold J. Cook, *Trials of an Ordinary Doctor*; Kevin Patrick Siena, *Venereal Disease, Hospitals, and the Urban Poor*, chap. 1; Harold J. Cook, *Matters of Exchange*, notably 30 and 66; David Gentilcore, *Medical Charlatanism*; David Boyd Haycock and Patrick Wallis, *Quackery and Commerce in Seventeenth-Century London*; Deborah E. Harkness, *The Jewel House*, chap. 2.

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well beyond a simple binary between “good practice” and “quackery.” The early commerce of American drugs developed in correspondence networks of physicians, who shipped potentially curative plants with their letters, as they were interested not only in exchanging information about properties and processes but also in accessing the natural products themselves.<sup>9</sup> Medical practitioners served as critical go-betweens in a “brokered world,” bridging patients and manufacturers, as well as Europe and the colonies, using their correspondence networks to enquire about novel and existing curing devices and passing these on to their clients (Hilaire-Pérez and Rabier, Zanetti). Surgeons retailed drugs and artifacts for a profit, like the famous *accoucheur* Pierre Robin in Reims, some acting as information agents on behalf of manufacturers. Dr. Auzoux, in Anna Maerker’s article, depended on the assistance of many fellow practitioners to retail his *papier mâché* models; a Dr. Lemercier sold his dummies in Russia; Dr. J. Millington, an anatomy teacher at William and Mary College in Virginia, used the models in his courses and demonstrated them in his office to potential customers in return for a significant commission. Private and hospital practitioners made extensive purchases of models and surgical tools for their hospital practice or individual patients. Dissecting this particular “consumption junction,” we uncover how medical practitioners exerted control over technological choices made by their private and public customers and indeed constructed the very medical nature of their tools, thereby creating medical value.<sup>10</sup>

Over the long eighteenth century, trades, medical or non-medical, used various strategies to brand things as “medical” and convince their professional brethren, patients, and others of their credibility. In retail businesses, the names of doctors were openly used to support the claims of cures, either as an advertising slogan or as a testimony of their actual use, when the practitioners did not act as commercial agents themselves. From the later nineteenth century and well into the twentieth, instrument manufacturers attended surgical operations or underwent medical training, with a view to learn, and in fact to co-define, the exact needs of their practicing users (Jones).<sup>11</sup> Doctors defined their patients’ needs and thereby shaped them, not so dissimilarly from door-to-door commercial agents of Burroughs Wellcome & Co., who contributed to the successful adaptation of graphite-compressing machines for the manufacture of pharmaceutical tablets.<sup>12</sup> Jones’s article makes clear that the access to new technologies in the medical market was made possible largely through the engagement of medical practitioners in their development, working in diverse functions as

9. Samir Boumediene, “Avoir et savoir.”

10. Ruth Schwartz Cowan, “The Consumption Junction.”

11. John V. Pickstone, “Bones in Lancashire”; Schlich, “Negotiating Technologies in Surgery”; Julie Anderson et al., *Surgeons, Manufacturers and Patients*.

12. Roy Church and E. M. Tansey, *Burroughs Wellcome & Co.*

agents or partners in businesses. Additionally, instrument makers and practitioners developed a variety of marketing devices and used textual and visual prints as vehicles for managing, disseminating, and consuming increasing volumes of commercial and professional knowledge. Printed works, from popular advertisements to domestic medicine and scholarly treatises, played a notable role in the definition of the medical realm and in transforming medical understanding. They have been rightly considered “medical technologies.”<sup>13</sup> The inclusion of new products into the existing medical armamentarium—which can be termed “medicalization”—implied significant social, economic, political, and cognitive transformations to technologies and their agents.

Accordingly, innovation in theoretical and practical medicine resulted from the translation of distinctive technological understandings from different trades into medical practice. Half a century ago, Owsei Temkin promoted a similar narrative for the incorporation of surgical thinking into medicine, which paid increased attention to the localization of disease.<sup>14</sup> This special issue extends this idea to other trades: medical practitioners drew analogies about materials and processes from other fields of expertise, shaping new understandings of both technology and medicine. Late-eighteenth-century medical-electrical devices fit in with human body parts as essential components of the healing apparatus (Zanetti). The new materials were assessed through the screen of apothecaries’ know-how: dosage standards and conditioning or galenic forms were defined and adapted to the nature and course of the disease, and in return, helped discriminate among body ailments. Different medical theories were called upon according to the possible uses of a technology: the inclusion of electricity in the medical armamentarium, as Zanetti argues, depended on analogies made to drugs in internal medicine or baths, or applied instruments in surgery. In this intellectual process, human body parts, when fitted with medical-electrical devices, became material components of the electrical machine. To the existing pharmacopeia, a large number of providers added new plants or materials, such as porcelain for teeth, chemical medicines, electricity, or exotic plants sought in the expanding colonial world.<sup>15</sup>

Medical innovation, in turn, affected technological thought. In the case of the varieties of cemented steel used in trusses, a range of conceptual bridges were drawn: the flexible properties of steel springs were compared

13. John Styles, “Product Innovation,” 148–58; Mary Fissell, “The Marketplace of Print”; Olivier Lafont, *Des Médicaments pour les pauvres*.

14. Owsei Temkin, “The Role of Surgery in the Rise of Modern Medical Thought.”

15. Colin Jones, “French Dentists and English Teeth in the Long Eighteenth Century”; Cavallo and Storey, *Healthy Living in Late Renaissance Italy*; James E. McClellan III and François Regourd, *The Colonial Machine*, 255–72; Pratik Chakrabarti, *Materials and Medicine*; Londa Schiebinger, *Plants and Empire*; Boumediene, “Avoir et savoir.”

to leather or fabric trusses, before steel itself was conceived as a fabric that could be shaped and tempered as a waistband. Artisans indeed offered responses to health-care needs and made innovations in medical science: truss- and stay-makers at first equipped injured bodies (Hilaire-Pérez and Rabier), but they also invented orthopedics, the technical dressage of children's growing bodies or the practical "art of correcting and preventing deformity in children."<sup>16</sup> When successful in medicine, a technology could in turn be employed in other learned activities, such as experimental science, as in the case of the cupping-glass manufacturing process applied to the air pump.<sup>17</sup> Long before the coinage of "the cyborg," medicine in the early industrial age was a site where powerful human-machine reconfigurations took place.<sup>18</sup>

The medicalization of technology, however, did not trigger an outspoken advocacy of the technologizing of medicine. In the aftermath of the groundbreaking work of Margarete Sandelowski, Zanetti, Maerker, and Jones's articles argue that the introduction of machines was a highly contested issue among practitioners, who carefully demarcated their renewed expertise with and without the use of technology.<sup>19</sup> In the course of half a century, electrical instruments were accepted as diagnostic and curing artifacts and, in the same movement, "black-boxed," both in discourse and materially, so that medical expertise lay not in their manufacturing, improvement, or handling, but in their orthodox application and in their users' resulting knowledge about bodies (Zanetti). Scholarly treatises and articles focused on application or dosage rather than on the tools themselves; the knowledge of the technician and inventor was thus habitually placed off-stage, making the technicians "invisible" in medical discourse or dismissed because of their lower status.<sup>20</sup> Like the anatomical-modeler Auzoux in Maerker's article, practitioners inclined to develop machines, however successful, were prevented from accessing major institutional medical positions. Accordingly, innovation and use of technology had implications not only on the artisanal world but also on the division of labor among physicians, surgeons, and other providers of medical services, as all were prompted to reconfigure their expertise in the face of innovations.<sup>21</sup>

Technological change in medicine also went hand in hand with transformation in medical information and education. Sometimes financially

16. Nicolas Andry, *L'Orthopédie, ou, l'art de prévenir et de corriger dans les enfans, les difformités du corps*, analyzed by Lynn Sorge-English, *Stays and Body Image in London*, 111–32.

17. Pamela H. Smith, *The Body of the Artisan*; Ursula Klein, "Apothecaries' Shops"; Terje Brundtland, "From Medicine to Natural Philosophy."

18. Donna Haraway, *Simians, Cyborgs and Women*; Lucy Suchman, *Human-Machine Reconfigurations*.

19. Margarete Sandelowski, *Devices and Desires*; Tone, *Devices and Desires*.

20. Steve Shapin, "The Invisible Technician."

21. Jaipreet Virdi, "Curtis' Cephaloscope."

supported by governments, such as Jean-Louis Petit's 1724 course on surgical instruments or Mme du Coudray's mechanical womb for the training of midwives, courses on medical instruments or model displays were widely advertised in the general and specialized press (Zanetti, Maerker). Information about medical technology, including drugs, was increasingly conveyed in new forms, ranging from dedicated treatises aimed at practitioners, which included names of instrument makers or lists of existing medical items, to self-care books, medical advertisements, and public lectures (Hilaire-Pérez and Rabier, Jones, Zanetti). Early-modern surgeons experimented with drawing instruments, their shapes and format, their proximity with print, and their relationship to the text (fig. 1). Educational artifacts, such as anatomical models (Maerker) or engraving of medicinal plants, belonged to the graphic chains that fashioned bodily and medical knowledge since the early-modern period, consumed not only by medical students and practitioners but also by European societies as a whole, from court elites to urban dwellers.<sup>22</sup> Following the diverse formats of medical catalogs, from pages in a surgical treatise to richly illustrated volumes in the nineteenth century, Claire Jones convincingly demonstrates that these publications gave shape to the medical knowledge of the time. By the early nineteenth century, catalogs mimicked treatises on medicine, using the same typeface, hard binding, and steel-plate engravings, and were presented and collected as reference works displaying visual and functional information about their devices. Authors, in turn, came to borrow plates of surgical tools from instrument makers to provide technological imagery for their medical treatises. It has been argued by several scholars that development of the medical record—which included printed tables for medical cases' note-taking, specialized press, and medical libraries—informed the “medical perception” studied by Michel Foucault.<sup>23</sup> By and large, “information technologies,” ranging from note-taking to hospital records, were critical in giving form and meaning to medicine in the early industrial age.

From advice to patients to trial experiments led in hospitals, assessing practices fashioned the medical being of technologies, while bespoke retailing and risk evaluations fostered clients' trust in unfamiliar artifacts. Manufacturers and practitioners provided consultations before and after the selling of drugs and devices, selecting and combining their techniques with other modes of managing illnesses. The special issue discusses the ways that trust in medical technologies was achieved, as a result of explicit or de facto assessments. Far from being a crux experiment, medical testing was dialectically achieved through a lengthy continuum from *ex-ante*, by expert procedures or learned bodies, to *ex-post*, by individual customers or whole gar-

22. Sachiko Kusakawa, *Picturing the Book of Nature*.

23. Michel Foucault, *The Birth of the Clinic*; Marc Berg, “Practices of Reading and Writing”; J. A. Mendelsohn and Volker Hess, “Cases and Series”; Emmanuelle Chapron, “Ad utilita publica.”

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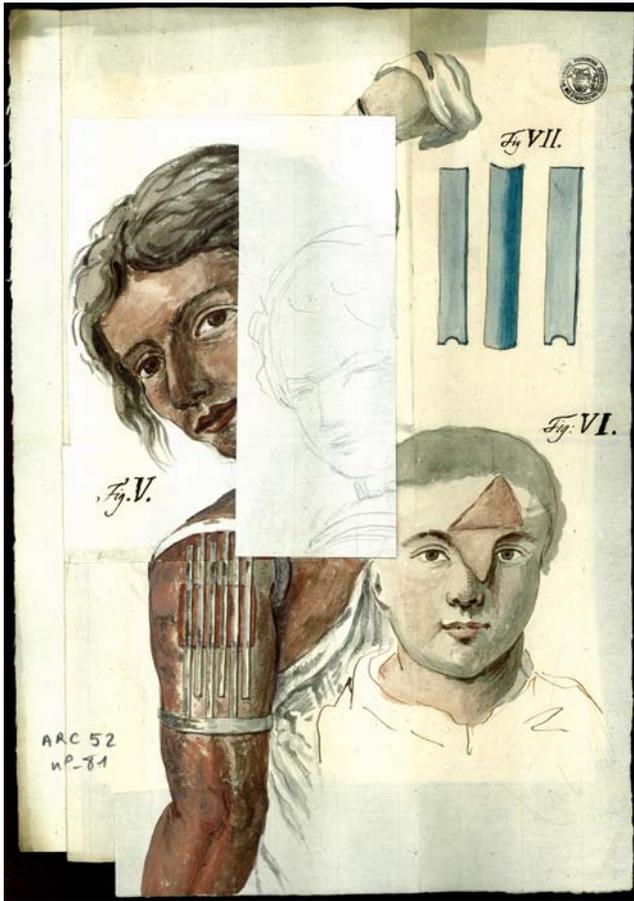


FIG. 1 Figures V, VI, and VII of anonymous memoir on the “simple means of treating contusions and wounds,” including mechanical means (no date, posterior to June 1785) addressed to the Académie royale de chirurgie, Paris. (Source: ©Académie nationale de médecine, Paris, ARC 52 n. 81. Reprinted with permission.)

risons, slowly shaping medical knowledge and standards (Hilaire-Pérez and Rabier, Zanetti). The medical trades made full use of the social ladder of clients to whom they had access, unevenly distributing risk between the poor and the well-to-do. Trials occurred in European courts and in hospitals. Jesuits used the “vile bodies” in their hospitals before English and French courtiers experimented with new medications.<sup>24</sup> Inoculation experiments were undertaken on prisoners, while steel-truss devices were tried at the Invalides hospital before being tendered to the army (Hilaire-Pérez

24. Boumediene, “Avoir et savoir.”

and Rabier). Collective electrical treatments for everyone were launched with the support of the French government before this practice found its niche among wealthy patients (Zanetti).<sup>25</sup> The articles here go some way into investigating the rise of the medical industry and how human and material dimensions of medical-technology evaluation represented a critical dimension of the co-production of medicine and European societies.

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## Materials, Users, and Exchange: The Manufacturing and Commodification of Medicine

Technology proves a useful concept to explore the multifaceted nature of medicine beyond the traditional world of doctors and their theories. This issue follows John Pickstone and Ilana Löwy's call to study medical innovation, which has enlarged our understanding of the scope of modern medical-care provision, surpassing its too-strictly defined boundaries.<sup>26</sup> Following in their footsteps, scholars have uncovered a world of manufacturing behind medicine: they have highlighted the role of industrialists in medical innovation, the social reconfigurations implied by the use of different technologies, and the crucial role of users in the promotion and adaptation of technologies for the modern period.<sup>27</sup> The four case studies go yet further in linking medical care into the manufacturing and commercial world of the long eighteenth century.

In the early industrial age, the medical industry involved trades far beyond the physician-surgeon-apothecary triad. The home, a key manufacturing setting for medical technologies in the period, provided remedies, sometimes with surprisingly large distribution networks. The court proved another productive place for medicines: early modern German noblewomen were medicinal artisans in that respect, while the Uffizi in Florence manufactured a number of diplomatic gifts in the form of medicines, which were distributed continent-wide, notably in Rome and Spain.<sup>28</sup> Hospitals—consumers of technologies since the late Middle Ages on a scale made possible by new organizational and commercial technologies and the rise of legal frameworks for public procurement—were thriving sites for innova-

25. Grégoire Chamayou, *Les Corps vils*.

26. John V. Pickstone, ed., *Medical Innovations in Historical Perspective*, 13; Pickstone, "Objects and Objectives"; Ilana Löwy, ed., *Medicine and Change*.

27. Robert Bud, Bernard S. Finn, and Helmuth Trischler, eds., *Manifesting Medicine*; Jennifer Stanton, "Making Sense of Technologies in Medicine"; Jennifer Stanton, ed., *Innovations in Health and Medicine*; Nelly Oudshoorn and Trevor Pinch, eds., *How Users Matter*; Carsten Timmermann and Julie Anderson, eds., *Devices and Designs*; Thomas Schlich, *Surgery, Science and Industry*.

28. Elaine Leong and Sara Pennell, "Recipe Collections and the Currency of Medical Knowledge"; Leong, "Making Medicines in the Early Modern Household"; Leong, "Collecting Knowledge for the Family"; Alisha Rankin, *Panacea's Daughters*; Fanny Kieffer, "Ferdinando I de' Medici (1587–1609) et les Offices."

tive financial tools, food processing, and mechanical manufacturing.<sup>29</sup> Medical care for individual patients or medical institution supply represented a profitable outlet for locksmiths, cutlers, toymakers, publishers, painters, druggists, and wax-modelers; these domains drew upon an immense artisanal technical skill, and the practical understanding of matter and processes of manufacture. After the continental success glassmakers had with eyewear, locksmiths turned to crafting prostheses to replace limbs that had been lost to war or venereal disease (fig. 2). Meanwhile printers engaged with thriving medical firms to manufacture everything from advertisements to instrument catalogs (Jones).<sup>30</sup>

Modelers manufactured anatomical devices for religious or erotic purposes alongside their educational counterparts in medical or veterinary sciences (Maerker). The flexible properties of cemented steel exploited by mechanical industries found a successful application in rupture management (Hilaire-Pérez and Rabier). The history of surgical instruments attests that surgeons and instrument makers experimented with materials over time. Their very use evolved according to availability and transformations of conceptual frameworks of hygiene and utility.<sup>31</sup> Inanimate matter was incorporated into technological processes for medical purposes, as were living materials.<sup>32</sup> In the business of providing visual tools for medicine, even body parts, such as preserved fetuses in glass tanks, skeletons, or organs became artifacts through injection, drying, and preservation, ready for trade and playing a significant role in the symbolic redistribution of practitioners.<sup>33</sup> Throughout the long eighteenth century, the supply of medical-care technology was an industry in the hands of many “entrepreneurs,” ranging from women in domestic environments and religious groups to specialized artisans, who supplied medical artifacts directly to a whole range of individual consumers or targeted the medical trade for larger distribution.

For medical technology, as with technology in general, users mattered in shaping devices and designs, as they requested, manufactured, and re-

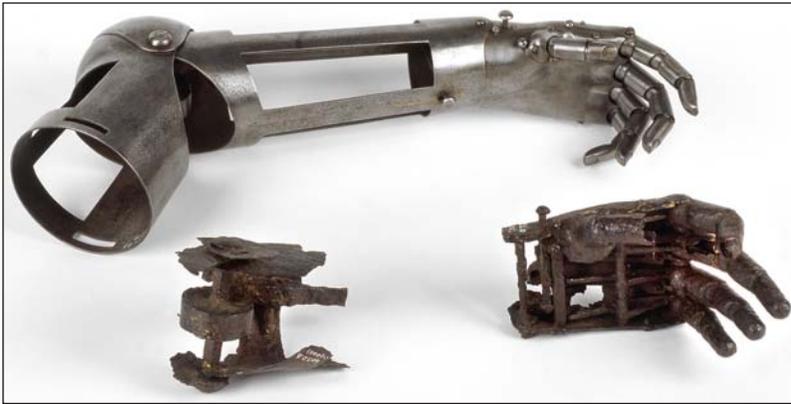
29. John Henderson, *The Renaissance Hospital*; Jonathan Reinartz, “Mechanising Medicine”; Pierre-Charles Pradier, “Les bénéfices terrestres de la charité”; Emma C. Spary, *Eating the Enlightenment*; Boumediene, “Avoir et savoir.”

30. Vincent Ilardi, *Renaissance Vision*; Claudia Stein, *Negotiating the French Pox*, chap. 4; John Alden, “Pills and Publishing”; James Harvey Young, “Patent Medicines”; Emma Spary, “Liqueurs and the Luxury Marketplace in Eighteenth-Century Paris.”

31. John Kirkup, *The Evolution of Surgical Instruments*; Teunis Willem van Heinigen, “Jean-Baptiste Sarlandière’s Mechanical Leeches”; Boumediene, “Avoir et savoir”; Matthew D. Eddy, “The Sparkling Nectar of Spas”; Barbara Orland, “Enlightened Milk.”

32. Plants from Asia or the Americas were looked for, transformed, and commodified into drugs by international trade companies or religious orders, which incorporated them into the European pharmacopeia, before chemists and apothecaries transformed milk and mineral waters into chemical substances; see Antonio Barrera, “Local Herbs”; Boumediene, “Avoir et savoir.”

33. Simon Chaplin, “John Hunter,” 134–55.



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**FIG. 2** Iron mechanical hand and articulated elbow fragment found in Balbronn Church, Alsace, dating from the sixteenth century. They most likely belonged to Junker Hans von Mittelhauser, wounded in 1525 during the Peasant Wars, for whom the city hall ordered a similar instrument to be forged by a local smith. (Source: Photo ©Musées de Strasbourg, Mathieu Bertola. Reprinted with permission.)

shaped artifacts to fit their health requirements.<sup>34</sup> As customers and handlers, users not only intervened in the final administering of the products; they also played an active part in their production, by selecting, modifying, and at times resisting them. A critical example of the “consumption junction,” the medical encounter between practitioner and patient critically shaped technologies. Such was the case with forceps, as women and their serving men—midwives promoted the use of these technological “hands” in preference to the head-extractors which killed the fetus in numerous mid-eighteenth-century cases; in breast-cancer treatment, women had powerful agency over the therapeutic technologies in use.<sup>35</sup>

For other artifacts, too, the home was a site for fitting and shaping devices in the early industrial age. As Zanetti argues in this issue, the 1770s electrical baths set up in patients’ or practitioners’ homes employed large technological assemblages in two rooms or more of the residence to protect patients from major disturbances such as the noises of the glass plates used to produce static electricity and the risks of glassware explosion. Locksmiths constructed smaller machines marketed to individual patients who were quite happy to escape collective cures and receive care at home.<sup>36</sup>

34. Oudshoorn and Pinch, eds., *How Users Matter*.

35. Adrian Wilson, “Midwifery”; Cowan, “The Consumption Junction”; Marjo Kaartinen, “Women Patients in the English Urban Medical Marketplace in the Long Eighteenth Century” and Kaartinen, *Breast Cancer in the Eighteenth Century*, chap. 3.

36. A similar translocation has been documented for water cures: Hilary Marland and Jane Adams, “Hydropathy at Home.”

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Product differentiation was a powerful answer to the diversity of medical clientele. The sites of use, where technological “fit” was accomplished, were many: they took place in the physical encounter of patients with practitioners/manufacturers at their shops or homes, and could also be defined from a distance, as patients adjusted and fitted artifacts to their precise needs by correspondence. Varied materials and designs reveal a segmented manufacturing of steel trusses, ranging from high-end ones made on demand to ready-made, mass-produced orthopedic devices supplied for the army (Hilaire-Pérez and Rabier). By engaging with these stories, this issue begins to link the history of technological medicine to the history of the burgeoning European consumer societies, which developed from the late Middle Ages in the Mediterranean states.<sup>37</sup> Users and their demands, which recent scholarship in medical history has started to evaluate, are likely to have shaped the medical industry during the early industrial age.<sup>38</sup>

Fulfilling or anticipating the demand of clients on the lookout for ways to cure their paralysis or to contain their hernias, marketing techniques slowly emerged from the mid-seventeenth century, shaping “commercial” medicine as well as medicine’s consumers.<sup>39</sup> From the seventeenth century on, the retailing of medical devices and remedies took place from door to door, in shops, and by mail order. Within medical trades, access to medical technology and information about it took a number of imaginative routes. Competing with sellers of proprietary remedies, early-nineteenth-century apothecaries developed medicine chests to retail ready-made drugs<sup>40</sup> (fig. 3). Surgeons in Philadelphia could acquire their instruments from an apothecary who imported them from overseas along with other medical commodities, at a deceased surgeon’s estate sale, or from a cutler, who might organize an auction to sell his supply of rare instruments to interested surgeons at an acceptable price for his client, while still making a large profit from the sale.<sup>41</sup>

Recent scholarship argues that trade fueled early-modern science and medicine; the medical trade was prominent in inventing modern marketing technologies (Hilaire-Pérez and Rabier, Jones).<sup>42</sup> Ever-widening wings of the “great chain of buying,” including urban signs and posters, shops’ merchandising, trade cards, print advertising, mail ordering, and pricing, slowly fostered and multiplied encounters between providers and clients of medicine.<sup>43</sup>

37. Richard A. Goldthwaite, *Wealth and the Demand for Art in Italy*; Lisa Jardine, *Wordly Goods*; Jan de Vries, *The Industrious Revolution*.

38. Ian Mortimer, *The Dying and the Doctors*; Siena, *Venereal Disease in Early-Modern London*.

39. John Brewer and Roy Porter, eds., *Consumption and the World of Goods*.

40. Emma O’Toole, “The Material Culture of Medicine in the Irish Home.”

41. James M. Edmonson, *American Surgical Instruments*, 1–8.

42. Paula Findlen and Pamela H. Smith, eds., *Merchants and Marvels*; Harold J. Cook, *Matters of Exchange*.

43. Colin Jones, “The Great Chain of Buying”; Siena, *Venereal Disease*; Haycock and



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**FIG. 3** Early-nineteenth-century family medicine chest. Maker unknown. Mahogany chest containing seventeen labeled flint glass jars, pestle and mortar, and pap bowl. (Source: Thackray Museum, Leeds. Reprinted with permission.)

Since the late sixteenth century, alchemists, apothecaries in their shops, and itinerant practitioners had developed significant skills in the display and marketing of their commodities. They employed efficient strategies in pricing, packaging, product differentiation, novelty claims, brand names, trade routes and markets and fairs, and promotional skills in print.

Indeed, nearly all possible knowledge of marketing seems to have been in use for medical goods in London and the European continent. Long before Wedgwood, medical manufacturers used the courts as soundingboards for marketing new curing processes: the success of the American drugs ipecacuanha and cinchona was launched in the royal courts of the English and French, like mesmerism, although the craze for the latter was short-lived.<sup>44</sup> The authors of “Fitting for Health” argue that printed works can rightly be considered medical tools, as they promoted domestic medicine or indeed any medical techniques or occupational tools. In their various forms, medical treatises or catalogs combined information with promotion and helped give shape to modern information technologies, just as the

Wallis, *Quackery and Commerce*; Gentilcore, *Medical Charlatanism*, 30–61; Patrick Wallis, *Consumption, Retailing and Medicine*; Louise Hill Curth, “Medical Advertising”; Harkness, *The Jewel House*; James Shaw and Evelyn Welch, *Making and Marketing Medicines*.

44. Boumediene, “Avoir et savoir”; Antoine Lilti, *Le Monde des salons*, 263–71.

global trade of material products did (Jones).<sup>45</sup> If public and private demand fueled the business of medicine and informed its technologies, innovations in marketing and communication made it successful, turning it into a model for other consumption markets.

Users of medical technologies encompassed not only individual patients, or those who acted on their behalf; this issue works to reconstruct the connected world of clients for medical technologies. In addition to parents, patrons, and heads of households as clients, part of the business was directed to large-scale institutions: royal or elite households (Maerker, Zanetti); hospitals' boards of governors (Jones); the military administration (Hilaire-Pérez and Rabier); and parishes or charities increasingly involved in medical provision.<sup>46</sup> In addition, the expanding populations of practitioners offering medical services were specific recipients of communication technologies (Jones). Physician-entrepreneur Auzoux's sturdy and colorful *papier mâché* models soon enjoyed great demand from medical students as aids for medical education. The French state supported the use of these models as substitutes for real corpses, an approach that was later extended to military veterinary anatomical training with Auzoux's horse model (Maerker). The development of medical instrument catalogs in nineteenth-century England was driven in part by the changing clientele of manufacturers, from individual surgeons to administrative boards managing large-scale procurements that edged out hospital practitioners' earlier authority over purchasing (Jones). The extent of the medical sector's integration is visible in Hilaire-Pérez and Rabier's article, as steel-truss manufacturers refined a retailing system to reach clients ranging from individual patients to colonial physicians to the procurement officers for national armies. These articles help uncover the competing agencies of various users in defining the nature of technologies as well as mediating their accessibility in the market and in the political arena.

During the early industrial age, medical technology and its supply and control indeed became a political matter. Medical practitioners prescribed technologies and authorized therapeutic practices. European societies continually reimagined different ways of regulating medicine from the late Middle Ages to the nineteenth century, delegating the assessment and distribution of medical technologies, notably drugs, to various social groups—physicians, surgeons, midwives, and apothecaries—which could in turn control innovation.<sup>47</sup> Governments delegated product quality and standards evaluations to trades, including medical ones; they granted privileges to

45. Jon Agar, Sarah Green, and Penny Harvey, "Cotton to Computers."

46. Brockliss and Jones, *The Medical World of Early-Modern France*, 731–34; Richard Smith, "Social Security as a Developmental Institution?"; Isabelle Coquillard, "Une Médecine paroissiale?"

47. Regrettably, the special issue has not been able to fully engage with the case of drugs as technologies.

medical guilds for selling drugs or orthopedic devices, requested assessments from medical bodies, licensed individual practitioners, or set up early standards for medical education. Membership in medical occupational associations, such as guilds or learned societies, was sometimes deemed a sufficient qualification for an individual to assess the quality of medical products, or to grant privileges and patents to individual practitioners. Getting an education or a degree in medicine was therefore a common way for artisans or manufacturers to enhance the credibility of the devices they sold (Hilaire-Pérez and Rabier, Jones, Maerker, Zanetti). Trust in medical technologies was sometimes enforced by European states and local governments by controlling manufacture and distribution. Urban governments and imperial administrations sometimes got directly involved in the assessment of drugs, setting a model for other technologies. In the exemplary case of quinquina, the Spanish state developed technologies of control over drug quality, ranging from notaries' certification of origin to state administration of *estanco* (monopoly).<sup>48</sup> Learned bodies such as the Académie royale de chirurgie or the Société royale de médecine developed protocols for assessing remedies, cosmetic products, or devices, characterizing new products as medical and claiming the state's expertise and authority over new technologies in the same move. Furthermore, as in the case of soldiers' riots over truss procurements, the political role of the medical trades could serve multiple purposes, as they could equally implement political order or serve to voice the interests of the disenfranchised (Hilaire-Pérez and Rabier).<sup>49</sup> Like other major early-modern infrastructures, a myriad of intellectual and indeed political actors, from patients to imperial administrators, created and contested the legitimacy of medical provision and its technology.<sup>50</sup> As such, medical technologies and their multicentered governance represented a significant dimension of early-modern European state politics and the definition of the *res publica*, which both call for further investigation.

Through the lens of medicine, the special issue offers new insights into technology from the early-modern period to the late nineteenth century, tracing its movements from raw material to product, through the process from manufacturing to use. These four articles at the intersection of technology studies, economic history, and medical history suggest directions for further research into the ways that technologies, medicine, and mixed economies were co-constructed, on the European continent and beyond. They invite readers to reconsider the material and social processes by which devices and drugs acquired a medical identity, as well as the economic and

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48. Matthew J. Crawford, "Para Desterrar las Dudas y Adulteraciones"; Crawford, "Empire's Experts"; Boumediene, "Avoir et savoir."

49. Catherine Lanoë, *La Poudre et le fard*; Erica Charters, "'The Intention Is Certainly Noble.'"

50. Chandra Mukerji, "Intelligent Uses of Engineering and the Legitimacy of State Power"; Michel Foucault, *The History of Sexuality*, vol. 1, 140.

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political channels through which medical technologies came into being, were promoted and deployed, or, in many cases, fell into oblivion. If technologies distinctively shaped medicine throughout the long eighteenth century and drove its changes, then in turn, the making of technological medicine was a slow, uneasy, contested process in which manufacturers, medical trades, consumers, and governments each played significant parts, with political implications. Through the narrow focus of two countries over the long eighteenth century, these articles examine a number of decisive points in this process—manufacturing, distribution, trust, communication, use—in which technologies and their makers, promoters, and users adjusted themselves in various ways to find techniques and treatments that fitted for health, co-constructing medicine and early industrial European societies. The following special issue is a call for further investigation into the long-term history of medical technologies.

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