

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

Reproductive Objects

SCOTTIE BUEHLER AND MARGARET CARLYLE

SUMMARY: This special issue traces the material “stuff”—the instruments and other material objects—that constitutes the uneven tapestries of power, authority, and knowledge making around human reproduction. To reevaluate our definition of what counts as a reproductive object, this collection recasts familiar objects, introduces new ones, and juxtaposes mundane things side-by-side with high-tech instruments. It also brings together various methodological approaches to highlight the myriad and multifaceted ways objects are enmeshed in sociomaterial webs. The resulting view of reproductive health care is thus contingent, fluid, and, fundamentally, material.

KEYWORDS: objects, material culture, reproduction, methodology

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

The objects examined in this special issue are reproductive in two senses: First, they represent the material things that aid, prevent, or end biological reproduction. Second, they are socially reproductive, meaning they reproduce (and sometimes contest) social relations.¹ “Reproductive Objects” draws attention to the diversity of material objects that perform various roles in health care by placing mundane things and high-tech instruments side by side and, ultimately, traces the materiality of the uneven tapestries of power, authority, and knowledge making around reproduction. Thick descriptions of objects expose social and material networks and probe the entanglement of materiality, knowledge, and practices.² Each of the objects studied thus becomes “a gathering place, a space for discussion and negotiation.”³ The contributors’ historical accounts eschew simplistic narratives of technological progress and reveal the central yet fickle nature of material stuffs to medical worldmaking.⁴

¹ For more on biological reproduction as social reproduction, see Dorothy Roberts, *Killing the Black Body: Race, Reproduction, and the Meaning of Liberty* (New York: Vintage, 2017); Khiara M. Bridges, *Reproducing Race: An Ethnography of Pregnancy as a Site of Racialization* (Berkeley: University of California Press, 2011).

² Clifford Geertz, “Thick Description: Toward an Interpretive Theory of Culture,” in *The Interpretation of Cultures* (New York: Basic Books, 1973), 3–30.

³ Amiria Henare, Martin Holbraad, and Sari Wastell, “Introduction,” in *Thinking through Things: Theorising Artefacts Ethnographically* (London: Routledge, 2007), 6.

⁴ On the social and material nature of medical worldmaking, see Keith Wailoo, *Drawing Blood: Technology and Disease Identity in Twentieth-Century America* (Baltimore: Johns Hopkins University Press, 1999); John Nott and Anna Harris, eds., *Making Sense of Medicine: Material Culture and the Reproduction of Medical Knowledge* (Bristol: Intellect, 2022); Annemarie Mol, *The Body Multiple: Ontology in Medical Practice* (Durham, N.C.: Duke University Press, 2003); Bruno Latour, *The Pasteurization of France*, trans. Alan Sheridan and John Law (Cambridge, Mass.: Harvard University Press, 1988); Lundy Braun, *Breathing Race into the Machine: The Surprising Career of the Spirometer from Plantation to Genetics* (Minneapolis: University of Minnesota Press, 2021).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

The term “technology” has been the subject of significant scholarly debate and comes layered with meanings. The word all too often functions as a shorthand for “progress” and “modernity,” remaining stubbornly resistant to scholarly attempts at rearticulation. During the nineteenth century, the development of the concept of civilization (and the associated “civilized races”) by white settlers and naturalists championed the idea of “technology” to justify colonization and racial hierarchies.⁵ The process by which the term was inscribed with such social and material power necessarily involved boundary drawing and the exclusion of low-tech and mundane objects, such as quilts or baskets, in order to discursively distinguish *techne* from “technology.” Thus, the term carries classed, raced, and gendered meanings, though industrialization and shifting social categories obscured these associations over the course of the nineteenth and twentieth centuries. Nina Lerman incites us to use “technology” as a category of analysis, à la Joan Scott, rather than a simple descriptive noun.⁶ By widening our gaze beyond familiar reproductive objects, we avoid the closing off that occurs with narrow definitions of technology.

Our case studies reject a priori distinctions between the social and the material or between theoretical and embodied forms of knowledge. On the one hand, the production and modification of material things occur within and are shaped by cultural contexts and, on the other

⁵ Nina E. Lerman, “Categories of Difference, Categories of Power: Bringing Gender and Race to the History of Technology,” *Technol. Cult.* 51, no. 4 (2010): 893–918, cites Rebecca Herzig, “Civilization and Histories of ‘Technology’” (unpublished manuscript, 2003); Leo Marx, “Technology: The Emergence of a Hazardous Concept,” *Soc. Res.* 64, no. 3 (Fall 1997): 965–88.

⁶ Lerman, “Categories of Difference” (n. 5); Joan Wallach Scott, “Gender: A Useful Category of Historical Analysis,” *Amer. Hist. Rev.* 91, no. 5 (December 1986): 1053–75.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

hand, materiality bounds the possibilities of cultural scripts.⁷ Centering objects does not seek to efface patients and users; they simply transform into individual actors among many involved in reproductive worldmaking. The resulting view of reproductive health care is thus contingent, fluid, and, fundamentally, material.

Contributions

Our *longue durée* history of reproductive objects begins in the eighteenth century, not because objects did not matter before, but because medical things became even more important to the creation and dissemination of scientific knowledge in that century. As Lucia Dacome writes, it “was the century of things. Ever more things were created, collected, used, consumed, and moved around. Things also promised to trigger a new era of knowledge.”⁸ Objects conveyed medical knowledge to audiences long excluded from elite science. Women toured *La Specola* in Italy, studying the life-size anatomical models produced in the workshop of Felice Fontana, while in Paris tourists viewed the wax models sculpted by Marie Marguerite Bihéron.⁹ The

⁷ For example, scientists have failed to market a hormonal contraceptive for men due to gendered ideas about reproductive responsibility. Nelly Oudshoorn, *The Male Pill: A Biography of a Technology in the Making* (Durham, N.C.: Duke University Press, 2003). On the other hand, Wendy Kline discusses how new technologies transformed cultural conceptions of reproductive bodies, *Bodies of Knowledge: Sexuality, Reproduction, and Women’s Health in the Second Wave* (Chicago: University of Chicago Press, 2010).

⁸ Lucia Dacome, *Malleable Anatomies: Models, Makers, and Material Culture in Eighteenth-Century Italy* (Oxford: Oxford University Press, 2017), 8.

⁹ There is a growing literature on Bihéron; see, e.g., Nina Rattner Gelbart, “Anatomist and Inventor: Marie-Marguerite Bihéron and Her Medical Museum (1719–1795),” in *Minerva’s French Sisters: Women of Science in Enlightenment France* (New Haven, Conn.: Yale University Press, 2021), 166–207; Margaret Carlyle, “Artisans, Patrons, and Enlightenment: The Circulation of Anatomical Knowledge in

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

French Academy of Surgery received a deluge of requests for approbations for various new tools to aid in childbirth, including an instrument to measure the diameters of the pelvis by Pierre-Victor Coutouly.¹⁰ These objects promised to reveal the secrets of the reproductive body and even provide control over it. Some practitioners, such as Italian midwifery instructor Luigi Galvani, claimed models grasped the natural truth of anatomy even better than the body itself, for the latter simply dried out, lost shape, and otherwise changed over time.¹¹ The desire to capture and master the reproductive body through models continued into the clinical age when giving birth in hospitals became more common.¹²

The widespread dissemination of obstetrical forceps represents the most iconic development of reproductive instruments in the eighteenth century, but historians have long disagreed on both the cause of this change in armamentarium and its impact on practice. Edmund Chapman published the first description of this instrument in 1733, though it had been used by the Chamberlens family of English physicians for at least a century.¹³ Many man-midwives immediately adopted the forceps to deliver living infants from obstructed labors, and these new tools came to signify the dominance of male (and thus scientific) obstetrics over female midwifery. According to Walter Radcliffe, the advent of the forceps “placed a powerful weapon

Paris, St. Petersburg, and London,” in *Bodies Beyond Borders: Moving Anatomies 1750–1950*, ed. Kaat Wils, Raf De Bont, and Sokhieng Au (Leuven: Leuven University Press, 2017), 23–49.

¹⁰ Académie Royale de Chirurgie, carton 27(B), dossier 5, pièce 78c, Coutouly, “Description d’un instrument propre a mesurer le petit diametre du Bassin,” 2 pp.

¹¹ Dacome, *Malleable Anatomies* (n. 8), 9.

¹² See Jessica M. Dandona, “(Re)producing Reproduction: Obstetrical Training Models and Methods, 1880–1900,” and Martina Schlünder, “Internal Rotation(s): Sociomaterial Practices and Embodiments in Hugo Sellheim’s Experiments on Birth Mechanics,” in this issue.

¹³ Walter Radcliffe, *Milestones in Midwifery and the Secret Instrument (The Birth of the Midwifery Forceps)* (San Francisco: Norman, 1989).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

in the hands of men-midwives. . . . With it they gained an ascendancy over their women rivals which has lasted to this day.”¹⁴ Historians since Radcliffe, however, have questioned how much explanatory weight these instruments should carry and have unsettled the once-persuasive narrative of the male takeover of childbirth using forceps. Many man-midwives critiqued the use and abuse of forceps, for instance, while some midwives found them to be useful expedients in certain birthing situations.¹⁵ If anything, both male and female practitioners contributed to and debated the extent to which childbirth would benefit from scientific rationalization.

By the end of the eighteenth century, obstetrical forceps sat at the intersection of technological ingenuity and larger processes of scientific rationalization and medical professionalization. Such objects remind us that it is difficult, if not impossible, to fully disentangle the history of medical instruments from histories of science and technology due to cross-pollination. Nevertheless, the questions asked and the themes picked up often differ in degree if not kind across historical subdisciplines. For example, though historians of science speak of a “practice turn” occurring after the Cold War, experiential knowledge and instruments

¹⁴ Ibid., 56.

¹⁵ Mary E. Fissell, “Man-Midwifery Revisited,” in *Reproduction: Antiquity to the Present Day*, ed. Nick Hopwood, Rebecca Flemming, and Lauren Kassell (Cambridge: Cambridge University Press, 2017), 319–32; Adrian Wilson, *The Making of Man-Midwifery: Childbirth in England, 1660–1770* (Cambridge, Mass.: Harvard University Press, 1995); Marie Baudoin, *The Art of Childbirth: A Seventeenth-Century Midwife’s Epistolary Treatise to Doctor Vallant: A Bilingual Edition*, trans. Cathy McClive (New York: Iter Press, 2023).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

had long been a topic of study for historians of medicine.¹⁶ Scholars of medicine specifically contend that instruments like the forceps define and reinforce occupational boundary drawing.¹⁷

Female birthing attendants contributed to professionalization campaigns in Italy, where midwives asserted their authority with a set of tools that they toted in bags made for the purpose. Jennifer Kosmin examines the humble midwifery bag and its contents, including syringes and hooks, and argues that it functioned as a symbol of both the midwife's commitment to modern medicine and the reproductive politics of a newly unified Italy in which generating future citizens represented a central concern. The midwife's bag carried with it new vocabularies and epistemologies: it signaled the midwife's expertise and embodied skill set, as much as the biomedical interests of a burgeoning nation. In this context, the bag increasingly functioned as a liminal object of scientific medicine and mediated the relationship between practitioner and patient in ways that delegitimated the pregnant patient's experience of childbirth. The midwife's bag thus carried a lot of proverbial baggage and (inadvertently) contributed to the estrangement of the patient.

Medical bags also provided a way to house and conceal the tools of the trade from moral authorities, such as law enforcement and religious institutions. This usage of the midwife's bag

¹⁶ On the practice turn in the history of science, see Pamela H. Smith, Amy R. W. Meyers, and Harold J. Cook, *Ways of Making and Knowing: The Material Culture of Empirical Knowledge* (Ann Arbor: University of Michigan Press, 2014); Jan Golinski, *Making Natural Knowledge: Constructivism and the History of Science, with a new Preface* (Chicago: University of Chicago Press, 2005). For historical examples, see C. J. S. Thompson, *The History and Evolution of Surgical Instruments* (New York: Schuman's, 1942); John Stewart Milne, *Surgical Instruments in Greek and Roman Times* (Oxford: Clarendon, 1907).

¹⁷ Wailoo, *Drawing Blood* (n. 4); Corinne Doria, "The Ophthalmoscope and the Physician: Technical Innovations and Professionalization of Medicine," *J. Material Cult.* 28, no. 2 (2023): 264–86.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

provides a window into the hidden practices of abortion. The same kinds of seemingly simple devices—from herbal remedies and rubber syringes to gauze and gloves—found in nineteenth-century Italian midwives’ bags also appeared in those of African American women working in the United States in the nineteenth and twentieth centuries. Here, too, the midwife’s bag evolved into a political tool. In the Jim Crow era, standard-issue bags with a list of permitted items were handed out to Black midwives, as authorities sought to discipline and regulate practitioners.¹⁸

Black lay birthing attendants nonetheless found innovative ways to ensure their community’s survival and the transmission of intergenerational knowledge. Cara Delay, Madeleine Ware, and Beth Sundstrom trace a case study of African American women in South Carolina who put their own reputations—and, indeed, their lives—at risk in their commitment to offer reproductive options to patients in the decades before the legalization of abortion. These authors draw on print, manuscript, and oral history sources to shine a light on the use of simple domestic objects (like turpentine, scissors, and rubber tubing) to perform abortions and ultimately disturb the supposedly neat line between “traditional” and “modern” reproductive technologies. Delay et al. cast South Carolinian women of color as innovators whose daring practices nurtured centuries of abortion techniques and tools shared in the early modern Atlantic world between West African, Native American, and settler European women.¹⁹

¹⁸ Annie Menzel, “The Midwife’s Bag, or, the Objects of Black Infant Mortality Prevention,” *Signs* 46, no. 2 (2020): 283–309.

¹⁹ On enslaved women’s forms of reproductive resistance, see Roberts, *Killing the Black Body* (n. 1), esp. 22–55; Liese M. Perrin, “Resisting Reproduction: Reconsidering Slave Contraception in the Old South,” *J. Amer. Stud.* 35, no. 2 (2001): 255–74.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

Reproductive objects also buttress professional boundaries by reforming care providers' bodily practices and retraining their physical senses.²⁰ The resulting comportment and vocabulary of practitioners become crucial ways of identifying expertise.²¹ Caroline Avery's in-depth study of the stethoscope provides a comparative look at practices of fetal auscultation in early nineteenth-century Dublin and Edinburgh. Physicians initially used the stethoscope to gain insight into the condition of the unborn child from outside the body and form an overall impression of pregnancy. The trained ear of the academic obstetrician could listen accurately—even through full clothing—and differentiate the various vital signs of mother and fetus. Fetal auscultation quickly became a kind of science, albeit a controversial and inconclusive one.

Avery homes in on how a multifunctional object like the stethoscope came to assume a key place in debates over best practices in pregnancies where the fetus's pulse could not be heard. The perceived absence of a pulse led to a cascade effect: it signaled a lack of vital signs and thereby prompted—and was used to justify—other interventions, such as the removal of the presumed dead fetus with a crotchet in order to save the mother. The ongoing debates over fetal auscultation between different medical schools served only to blur the definitions of proper instrument usage and highlight the limited clinical reliability of the stethoscope. The debates

²⁰ Malcolm Nicholson, "The Introduction of Percussion and Stethoscopy to Early Nineteenth-Century Edinburgh," in *Medicine and the Five Senses*, ed. W. F. Bynum and Roy Porter (Cambridge: Cambridge University Press, 1993), 134–53; Sarah Maslen, "Researching the Senses as Knowledge: A Case Study of Learning to Hear Medically," *Senses Soc.* 10, no. 1 (2015): 52–70; multiple essays in Nott and Harris, *Making Sense of Medicine* (n. 4), such as Claire Wendland, "This Thing, a Stethoscope" (384–93), and Kelly Underman, "The Context of Touch: Gloves and the Pelvic Exam" (187–93).

²¹ E. Summerson Carr, "Enactments of Expertise," *Annu. Rev. Anthropol.* 39 (2010): 17–32; Anna Maerker, "Anatomizing the Trade: Designing and Marketing Anatomical Models as Medical Technologies, ca.1700–1900," *Technol. Cult.* 54, no. 3 (2013): 531–62.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

confirmed practitioners' preexisting biases about what constituted best practices in difficult deliveries. Avery opens discussions into how familiar and seemingly simple instruments like the stethoscope can get bogged down in disciplinary debates and ultimately fail to fulfill promises to consolidate diagnostic procedures.

Some medical instruments', like the stethoscope's, ability to extend human senses and thus transform clinicians' bodily practices ushered in the age of clinical medicine, at least according to Foucault's classic narrative. Patients also required new comportment to acquiesce to medicine's intrusions into the body.²² But novel instruments can also remake physiological processes.²³ The advent of IVF in 1978, for example, unprecedentedly transformed reproductive physiology through technological and pharmaceutical intervention. It was hailed as an exemplar of medical heroism in which technology morphed ostensibly infertile couples into fertile ones.²⁴ As we see in the next essay, though, bodies themselves can also act as technology as they perform specialized tasks.²⁵

Aparna Nair draws on oral history interviews and colonial archival records to expand our definition of technology to include the hands of midwives. While the rise of biomedicine and its

²² Michel Foucault, *The Birth of the Clinic: An Archaeology of Medical Perception*, trans. A. Sheridan (London: Routledge, 1973).

²³ Bynum and Porter, *Medicine and the Five Senses* (n. 20); Barbara Duden, *Disembodying Women: Perspectives on Pregnancy and the Unborn*, trans. Lee Hoinacki (Cambridge, Mass.: Harvard University Press, 1993); Henare, Holbraad, and Wastell, *Thinking through Things* (n. 3).

²⁴ Nick Hopwood, "Artificial Fertilization," in Hopwood, Flemming, and Kassell, *Reproduction* (n. 15), 581–96; Robin Marantz Henig, *Pandora's Baby: How the First Test Tube Babies Sparked the Reproductive Revolution* (Cold Spring Harbor, N.Y.: Cold Spring Harbor Laboratory Press, 2006); Katharine Dow, "'The Men Who Made the Breakthrough': How the British Press Represented Patrick Steptoe and Robert Edwards in 1978," *Reprod. Biomed. Soc. Online* 4 (2017): 59–67.

²⁵ Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: University of Chicago Press, 2018), esp. chap. 3.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

attendant technologies paved the way for the medicalization of childbirth in colonial India, the female birthing attendant known as *vayattati*—literally, “the stomach shaker”—quietly carried on practicing in the outlier state of Kerala. Vayattatis’ own bodies, specifically their hands, not constructed tools like the obstetrical forceps or the speculum, served as their greatest assets in overcoming underresourced conditions. Human hands gained new currency against the backdrop of the mechanization of industrial production that reached every corner of the British Empire, including South India. Vayattatis’ hands functioned as diagnostic tools in determining how far along a pregnancy was, how labor was progressing, and whether a birth would be straightforward or difficult.²⁶

In the process of putting their hands to such uses, the *vayattatis* developed their own nosologies of the female body to guide their decision-making and treatment protocols. Nair’s article retrieves the *vayattatis* and the practices of their dexterous hands from dichotomous narratives that pit modernity and medicalization against tradition and techniques.²⁷ It adds layers of complexity to histories of the instrument-driven male takeover of childbirth by suggesting that the emergence of biomedicine was not restricted to male practitioners.²⁸ Nor was technological progress anathema to the *vayattati*.

²⁶ Lissa L. Roberts, Simon Schaffer, and Peter Dear, eds., *The Mindful Hand: Inquiry and Invention from the Late Renaissance to Early Industrialisation* (Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen, 2007).

²⁷ On the intersection of science and modernity in colonial India, see Gyan Prakash, *Another Reason: Science and the Imagination of Modern India* (Princeton, N.J.: Princeton University Press, 1999).

²⁸ On the more traditional account, see Radcliffe, *Milestones in Midwifery* (n. 13). More recent scholarship includes Fissell, “Man-Midwifery Revisited” (n. 15).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

Concerns about the formation of medical expertise and professionalization have led scholars to turn to the history of pedagogical objects. Anatomical models, manikins, images, and simulators in medical training ingrain proper comportment and bodily practices and convey tacit knowledge and skills, all without risking the safety of patients.²⁹ Notably, many practitioners of the eighteenth and nineteenth centuries received experiential training on obstetrical manikins, after their popular introduction in midwifery classrooms. Childbirth dolls provided students with a chance to learn best practices by testing out a variety of birthing maneuvers, an opportunity especially prized by male trainees in a city like Paris, who lacked the access to patients enjoyed by their female counterparts who trained at the Hôtel-Dieu.³⁰ Jessica M. Dandona's deep dive into the Budin-Picard manikin traces its association with male obstetrical authority after its debut at the Paris Universal Exposition of 1878. The manikin was fashioned with materials that underwent many industrial and artisanal processes, from rubber making to woodworking, and included simulative flourishes, such as a mock fetus floating in a fluid-filled bag. The resulting manikin assumed the stature of a masculine invention through processes of patenting, manufacturing, and marketing. It also symbolized the prevailing view of childbirth as a mechanical exercise in which the body became a mere vessel of gestation.³¹

²⁹ Nott and Harris, *Making Sense of Medicine* (n. 4); Harry Owen, "Simulation in Obstetrics, Gynecology and Midwifery," in *Simulation in Healthcare Education: An Extensive History* (Cham: Springer, 2016), 69–244.

³⁰ Margaret Carlyle, "Phantoms in the Classroom: Midwifery Training in Enlightenment Europe," *KNOW* 2, no. 1 (Spring 2018): 111–136; Pamela Lieske, "'Made in Imitation of Real Women and Children': Obstetrical Machines in Eighteenth-Century Britain," in *The Female Body in Medicine and Literature*, ed. Andrew Mangham and Greta Depledge (Manchester: Manchester University Press, 2011), 69–88.

³¹ Andrea Henderson, "Doll-Machines and Butcher-Shop Meat: Models of Childbirth in the Early Stages of Industrial Capitalism," *Genders* 12 (Winter 1991): 100–119.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

Pedagogical objects like the Budin-Picard manikin gained value as medical tools befitting an industrial age, but there always comes a time when trainees need to apply classroom skills to real-life birthing situations. Having gained hands-on experience in clinical spaces, practitioners developed a range of specialized instruments, like the speculum, further cementing and exemplifying professionalization.³² In the nineteenth century, material interventions into labor increasingly characterized clinical decision-making that revolved, quite literally, around questions of life and death. Fetuses assumed heightened importance as lives worth saving, ultimately opening reproductive bodies up to new systems of control.³³ The zeal for instrumental intervention in nineteenth-century childbirth, therefore, gave rise to moral and legal questions about bodily agency and integrity that continue to inform our reproductive landscape today.

Historians of medicine have revealed the centrality of material objects—from paper technologies to instruments—to knowledge making.³⁴ Humans think with and through objects. Hans-Jörg Rheinberger described the “glue” of experimental systems as “material” in nature, not

³² Andrew Cunningham and Perry Williams, eds., *The Laboratory Revolution* (Cambridge: Cambridge University Press, 1992), esp. “Introduction.”

³³ Felicity M. Turner, *Proving Pregnancy: Gender, Law, and Medical Knowledge in Nineteenth-Century America* (Chapel Hill: University of North Carolina Press, 2022); Elizabeth O’Brien, *Surgery and Salvation: The Roots of Reproductive Injustice in Mexico, 1770–1940* (Chapel Hill: University of North Carolina Press, 2023).

³⁴ To name just a few, Smith, Meyers, and Cook, *Ways of Making and Knowing* (n. 16); Carla Bittel, Elaine Leong, and Christine von Oertzen, *Working with Paper: Gendered Practices in the History of Knowledge* (Pittsburgh: University of Pittsburgh Press, 2019); Soraya de Chadarevian and Nick Hopwood, *Models: The Third Dimension of Science* (Stanford, Calif.: Stanford University Press, 2004); Nick Hopwood, *Haeckel’s Embryos: Images, Evolution, and Fraud*, Illustrated ed. (Chicago: University of Chicago Press, 2015); Nott and Harris, *Making Sense of Medicine* (n. 4); Scottie Hale Buehler, “Aborted Dreams and Contested Labors: The Société Royale de Médecine’s 1786 Survey of Midwives,” *Bull. Hist. Med.* 95, no. 2 (2021): 137–68.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

epistemic.³⁵ Historians have even teased out variations between types of objects involved in knowledge production.³⁶ Scientific knowledge does not always exist prior to the production of objects; it is often made through the creation, use, and circulation of them.³⁷ Whether models or images, objects are not passive canvases on which humans paint, but actively shape and reconfigure the knowledge produced.

Rebecca Jackson's look at the misappropriation of Emanuel A. Friedman's cervical dilation-time curve highlights how clinical devices often black box concepts in the name of practical application. Drawing on oral history, as well as Friedman's notebooks and scientific publications, Jackson recovers his original intentions as a junior physician tasked by his superior—the anesthesiologist Virginia Apgar (of Apgar score fame)—with analyzing physiological progress in labor. He settled on his eponymous “curve” that measured labor progress on the basis of cervical dilation. To validate his curve and the manual methods he used to determine cervical dilation, he devised a new instrument called the “cervimeter” in 1956. While it served him as “an excellent academic tool,” he never intended it for clinical practice, just as he never intended for cervical dilation in centimeters to serve as *the* measure of labor progress and risk.

Friedman's cervimeter reveals how the ways in which objects facilitate medical worldmaking are far from straightforward. To borrow the language of Lucia Dacome, Dahlia

³⁵ Hans-Jörg Rheinberger, *Toward a History of Epistemic Things* (Stanford, Calif.: Stanford University Press, 1997).

³⁶ De Chadarevian and Hopwood, *Models* (n. 34); Sachiko Kusukawa, *Picturing the Book of Nature* (Chicago: University of Chicago Press, 2012); Michael Sappol, *Body Modern: Fritz Kahn, Scientific Illustration, and the Homuncular Subject* (Minneapolis: University of Minnesota Press, 2017).

³⁷ See n. 31.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

Porter, and Courtney Roby, materials are “unruly”: inherent tensions arise through practices of translation, transformation, mediation, and negotiation across media. These processes frequently involve friction and resistance.³⁸ In addition to unruliness, some objects are fluid. Their boundaries, definitions of success or failure, and even the identity of their maker can be vague and shifting. The resulting lack of boundedness allows objects to adapt across contexts with ease.³⁹ While historians of medicine have captured the fluidity of clinical diagnosis, even objects’ role in mediating clinical diagnosis, they have given less attention to the fluidity of medical tools themselves.⁴⁰ The reproductive objects in this collection are equally uncooperative, frequently perform in unexpected ways, and blur boundaries. It is these moments of fluidity and friction that intrigue us most.

Jackson exposes a fundamental disconnect between Friedman’s curve and cervimeter, on the one hand, and the ways in which they were put into practice by technological users, on the other hand. Since technologies provoke contestation and negotiation, users also mold the ultimate form and meaning of any object. Yet identifying users is not always clear-cut. Users shift into producers as easily as producers into users. Are users the operator? The consumer? The

³⁸ Lucia Dacome et al., “Unruly Objects—Material Entanglements in the Arts and Sciences: Introduction,” *Nuncius* 35, no. 3 (December 14, 2020): 461–70, <https://doi.org/10.1163/18253911-03503018>.

³⁹ Marianne de Laet and Annemarie Mol, “The Zimbabwe Bush Pump: Mechanics of a Fluid Technology,” *Soc. Stud. Sci.* 30, no. 2 (April 1, 2000): 225–63, <https://doi.org/10.1177/030631200030002002>.

⁴⁰ On the fluidity of clinical diagnosis, see Charles E. Rosenberg, “Introduction Framing Disease: Illness, Society, and History,” in *Framing Disease: Studies in Cultural History*, ed. Charles E. Rosenberg and Janet Golden (New Brunswick, N.J.: Rutgers University Press, 1992). On the role of objects in the fluidity of clinical diagnosis, see Wailoo, *Drawing Blood* (n. 4). An important study of the fluidity of a medical technology is Braun, *Breathing Race into the Machine* (n. 4).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

person to whom the object is applied? The beneficiary?⁴¹ In the hands of well-meaning nurses and obstetricians looking for certainty and protocols in the face of real-life labors, Friedman’s innovations inadvertently gave rise to the concept of “centimeters of dilation” as the objective measure of a patient’s progression of labor. Jackson looks critically at the fallout of this unintended consequence, including the increasing objectification of the reproductive body and the establishment of normative birthing bodies (and the concomitant pathologizing of bodies that deviate). The tension, embodied in the cervimeter, between patients’ bodily experiences and care providers’ quest for quantification continues to resonate today.

By the 1980s, critiques of social constructivism—“the central notion that scientific knowledge is a human creation, made with available material and cultural resources, rather than simply the revelation of a natural order”—arose from within science and technology studies (STS).⁴² Scholars criticized a lack of serious attention to materiality and noted social constructivism’s inability to fully explain the formation of agreed-upon conceptions of reality. STS scholars challenged presumed differences between human and nonhuman actors and disrupted the presupposed unidirectional flow of change from technology to society. The ontological turn in feminist science studies offered its own solution to the inherent tensions in

⁴¹ Ann Rudinow Saetnan, “Women’s Involvement with Reproductive Medicine: Introducing Shared Concepts,” in *Bodies of Technology: Women’s Involvement with Reproductive Medicine*, ed. Ann Rudinow Saetnan, Nelly Oudshoorn, and Marta Kirejczyk (Columbus: Ohio State University Press, 2000), 1–30; Jenna Healey, “Bluetooth Babies: Reproductive Technology in the Information Age,” *Technology’s Stories*, December 7, 2016, <https://doi.org/10.15763/JOU.TS.2017.4.1.02>; Sarah A. Leavitt, “‘A Private Little Revolution’: The Home Pregnancy Test in American Culture,” *Bull. Hist. Med.* 80, no. 2 (2006): 317–45; Nelly Oudshoorn and Trevor Pinch, eds., *How Users Matter: The Co-Construction of Users and Technology*, rev. ed. (Cambridge, Mass.: MIT Press, 2005).

⁴² Golinski, *Making Natural Knowledge* (n. 16), 6.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

social constructivism by shifting away from studying social realities to the formation of physical realities. These feminist scholars, inspired by Donna Haraway, reject dichotomies including the human/nonhuman, body/mind, and nature/culture.⁴³ In seeking to understand how reality is constructed in practice as a seemingly coherent and singular entity, they find that multiple ontologies exist, all variously entangled with each other. It is only through concerted and strenuous effort that realities cohere.⁴⁴ Ontology, therefore, inhabits a specific space and time. Despite the fact this point appears to lend itself to historical study—for what are historians, but experts in the contingencies of place and time?—scant Anglophone scholarship on medicine utilizes these methods.⁴⁵ This fact may be owing, in part, to the limitations of source material and the difficulties in reconstructing past practices in sufficient detail.

Martina Schlünder pulls from feminist science studies methodologies to analyze how one generation's paradigm for understanding the processes of childbirth can provide the experimental challenge for the next. Research programs in turn-of-the-twentieth-century Germany asserted a new “thought style,” in the vocabulary of theorist Ludwig Fleck, in which physiological explanations of childbirth were pursued counter to the dominant mechanistic conceptions of the

⁴³ Donna Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991); Haraway, *Primate Visions: Gender, Race, and Nature in the World of Modern Science* (New York: Routledge, 1990).

⁴⁴ For work in this vein, see Karen Barad, *Meeting the Universe Halfway* (Durham, N.C.: Duke University Press, 2007); Mol, *Body Multiple* (n. 4).

⁴⁵ Dutch scholars in particular have given this approach, sometimes called new materialisms, more attention. A striking example is Annemarie Mol's *The Body Multiple* (n. 4). Lindsey Breitwieser has forthcoming work on postmortem pregnancies that will help correct this imbalance. For now, see Lindsey N. Breitwieser, “Dead Mothers, Live Births: Postmortem Pregnancy and the Politics of Life and Death” (Ph.D. diss., Indiana University, 2019).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

period.⁴⁶ Schlünder's article reconstructs physician Hugo Sellheim's reinterpretation of the birthing body as akin to joint fluid mechanical forces, rather than static anatomical interactions, through the sociomaterial life of the objects that he devised to test out his new approach.

Sellheim pursued reenactment experiments and developed simulative machines with the aim of understanding fetal rotation through the birth canal. When his naked and soap-covered assistant got stuck as he tried to rotate his way through an adult-sized mock birth canal composed of a curved glass tube, Sellheim must have realized that theory did not always translate into practice. In thinking about the shape-shifting fetus and its dynamic interactions with the birth canal, Sellheim's experiments with his birthing machines materialized a new kind of reproductive body in which birth occurred as a hydraulic process. Schlünder's approach demonstrates that it is "not the result of the research but the way in which the research was done" (p. XXX) that is of greatest interest.

Reproductive objects are too often touted as either emancipatory or oppressive.⁴⁷ More recent scholarship has challenged us to reject such black-and-white thinking and instead place technologies within "existing structures and hierarchies, and the circumstances of women's access."⁴⁸ Class, ability, citizenship status, and race all dictate access to and experiences of

⁴⁶ Ludwig Fleck, *Genesis and Development of a Scientific Fact*, ed. Thaddeus J. Trenn and Robert K. Merton, trans. Fred Bradley and Thaddeus J. Trenn (Chicago: University of Chicago Press, 1935).

⁴⁷ An important corrective to the emancipatory narrative is provided by Jennifer Nelson, who looks at the Black Panther Party's initial opposition to the birth control pill. See "'An Instrument of Genocide': The Black Nationalist Campaign Against Birth Control," in *Women of Color and the Reproductive Rights Movement* (New York: New York University Press, 2003), 85–112.

⁴⁸ Mytheli Sreenivas, "Introduction," *Frontiers* 34, no. 3 (2013): viii.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

reproductive technologies.⁴⁹ The example of the electronic fetal heart monitor (EFM) analyzed by Whitney Wood and Danielle Cossey-Sutton lends insight into how colonial medical policies have actively undermined Indigenous healing practices and left their communities in Canada's northern territories reliant on a remote and disempowering system.

During the 1970s and 1980s, new technologies like the EFM emerged as essential for tracking the risk status of pregnancies. Northern nursing outposts lacked these new obstetrical tools, and rather than supply them, medical practitioners deployed the language of reproductive “choice” to spur the removal of pregnant First Nations and Inuit women to high-tech centers. The development of the EFM ended up refashioning notions of obstetric risk in racist ways by drawing upon assumptions about biological racial difference. Practitioners classified the pregnancies of Indigenous women as “high risk” as a matter of course. The central role played by EFM in curtailing the reproductive choices of Indigenous women mirrors the racialized “medical apartheid” that continues to this day.⁵⁰

Wood and Cossey-Sutton's examination of the racial politics of EFM points to a growing body of literature on the role of material artifacts in naturalizing ideas about human difference

⁴⁹ Margaret Marsh and Wanda Ronner, *The Pursuit of Parenthood: Reproductive Technology from Test-Tube Babies to Uterus Transplants* (Baltimore: Johns Hopkins University Press, 2019); Angela Davis, “Racism, Birth Control, and Reproductive Rights,” in *Women, Race, and Class* (New York: Random House, 1981); Doris Leibetseder, “Reproductive Ethics: An Example of an Allied Dis/Ability-Queer-Feminist Justice,” in *Queering Paradigms VI: Interventions, Ethics and Glocalities*, ed. Bee Scherer (Oxford: Peter Lang, 2016); Michelle Jarman, “Relations of Abortion: Crip Approaches to Reproductive Justice,” *Fem. Formations* 27, no. 1 (2015): 46–66.

⁵⁰ Harriet A. Washington, *Medical Apartheid: The Dark History of Medical Experimentation on Black Americans from Colonial Times to the Present* (New York: Vintage, 2008).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

along various axes of identity.⁵¹ As Keith Wailoo elucidates, “technologies are used (somewhat ritualistically) to create meaning, shape identity, and to construct diseases.”⁵² Physicians in twentieth-century Mexico fixated on using measurements of pelvises obtained with bespoke instruments in order to justify their theories of racial science and sterilization campaigns.⁵³ Furthermore, medical objects often rely on access to nonconsenting bodies for their creation and modification. Deirdre Cooper Owens establishes that the development of the speculum in the United States depended on the availability of enslaved women’s bodies.⁵⁴ Therefore, objects are sites both for the performance of and contestations around social relations and “carry with them various exclusions and injustices of the past.”⁵⁵

Many of the essays in this volume remind us that while the parturient body sits at the center of childbirth, its perspective is too frequently obscured in narratives of technological progress. The long history of reducing the pregnant body to a carrier vessel and disenfranchising it from biomedical decision-making has its roots in the aesthetics of eighteenth-century medical atlases, in which close-ups of the fetus nestled in abstract bony pelvises replace earlier depictions of full-bodied pregnant persons. This imagery has had far-reaching consequences in shaping

⁵¹ Charis Thompson, *Making Parents: The Ontological Choreography of Reproductive Technologies* (Cambridge, Mass.: MIT Press, 2005); Braun, *Breathing Race into the Machine* (n. 4); James Poskett, *Materials of the Mind: Phrenology, Race, and the Global History of Science, 1815–1920* (Chicago: University of Chicago Press, 2022).

⁵² Wailoo, *Drawing Blood* (n. 4), ix.

⁵³ Elizabeth O’Brien, “Pelvimetry and the Persistence of Racial Science in Obstetrics,” *Endeavour* 37, no. 1 (2012): 21–28; O’Brien, *Surgery and Salvation* (n. 33).

⁵⁴ Deirdre Cooper Owens, *Medical Bondage: Race, Gender, and the Origins of American Gynecology*, Illustrated ed. (Athens: University of Georgia Press, 2018).

⁵⁵ Lerman, “Categories of Difference” (n. 5), 918. See also Saetnan, “Women’s Involvement with Reproductive Medicine” (n. 41).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

public perceptions of pregnancy and in cultivating a mechanistic view of reproduction that often disembodies the individual.⁵⁶

The process of disembodiment happens in many different ways. As Rosalind Pollack Petchesky has shown, the fetal ultrasound in which the pregnant body vanishes has been appropriated as the primary visual vehicle by the antiabortion movement. Ultrasound technology has its roots in the use of sonar in submarine warfare before it was deployed in the service of medical imaging and, eventually, obstetrics. Once it entered the sphere of reproductive medicine, the ultrasound detected pregnancies and tracked fetal progress. The erasure of the pregnant person in ultrasound images presented to the public and policy makers asserts fetal rights, erodes reproductive choices, and, ultimately, excludes the pregnant person from decision-making.⁵⁷ In contemporary times, ultrasound images have transformed into ideological tools and political weapons.

Reproductive objects arise from knotty political contexts and thus are never neutral. Moreover, their meanings, uses, and effects morph across time, place, and cultural environment. To treat them uncritically risks replicating past medical harms.

⁵⁶ Henderson, “Doll-Machines” (n. 31); Lyle Massey, “On Waxes and Wombs: Eighteenth-Century Representations of the Gravid Uterus,” in *Ephemeral Bodies: Wax Sculpture and the Human Figure*, ed. Roberta Panzanelli (Los Angeles: Getty Research Institute, 2008), 83–107; Margaret Carlyle and Brian Callender, “The Fetus in Utero: From Mystery to Social Media,” *KNOW* 3, no. 1 (2019): 15–67, esp. 32–47.

⁵⁷ Rosalind Pollack Petchesky, “The Power of Visual Culture in the Politics of Reproduction,” *Fem. Sci. Stud.* 13, no. 2 (Summer 1987): 263–92.

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

Conclusion

Sellheim's failed artificial birth canal, the EFM, and abortion tools—to name just a few of the objects in this special issue—all point to the continued importance of scholarly interrogations of the materiality of reproduction to our collective future. We now find ourselves in a brave new technological world, at the crossroads of seemingly infinite reproductive choices, on the one hand, and the retraction of the right to abortion, on the other hand. The rapid expansion of assisted reproductive technologies like in-vitro fertilization, frozen embryo transfer (FET), and zygote intrafallopian transfer (ZIFT) has provided more pathways to parenthood than ever before. A tension nonetheless remains between the fundamental bodily rights that women and pregnant people have lost and the technological gains that have multiplied reproductive choices, especially in highly profitable sectors like the in/fertility market.⁵⁸

“Reproductive Objects” makes no claims to comprehensiveness in regard to geographic or temporal breadth or themes covered; the history of reproductive objects is too vast and too diverse for that. Instead, our *longue durée* approach captures a panoramic view of the manifold materialities of pregnancy and childbirth. This collection challenges our definitions of what counts as a reproductive object by recasting familiar objects in a new light and introducing new artifacts. It also brings together various methodological approaches to highlight the myriad and multifaceted ways objects are enmeshed in sociomaterial webs. Accordingly, we hope you discover the laden reproductivity of objects.

⁵⁸ Rene Almeling, *Sex Cells: The Medical Market for Eggs and Sperm* (Berkeley: University of California Press, 2011).

This is a preprint of an accepted article scheduled to appear in the *Bulletin of the History of Medicine*, vol. 99, no. 1 (Spring 2025). It has been copyedited but not paginated. Further edits are possible. Please check back for final article publication details.

*

SCOTTIE BUEHLER is a midwife turned historian of medicine. Her research investigates the widespread implementation of midwifery training programs across the French Atlantic. She holds positions as Assistant Professor of History and Director of Medical and Health Humanities at Sam Houston State University

MARGARET CARLYLE is an Assistant Professor at the University of British Columbia Okanagan. She specializes in the history of medicine, science, and technology in early modern France and the Atlantic world. Her research centers on women's contributions to the development of medico-scientific knowledge, including their roles as experimentalists, inventors, artisans, and translators. She is currently completing two book projects: *Women and Anatomy in Enlightenment France*, which charts the role of women in the rise of modern anatomy, and *Delivering the Enlightenment*, which delves into the history of reproductive technologies in eighteenth-century France.