



Portrait of an Organ: A Cultural Analysis of Medical Images and Treatments of the Uterus

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Theoretical Study

Abstract

Medical imaging of the uterus has a long, rich, and important history; yet, how the cultural past bears on current-day medical thinking and procedures is rarely considered. This paper examines the influential early modern idea of the autonomous womb, its resonance within modern medicine, and its traces in medical imaging and procedures. We argue that descriptions of the autonomous womb, as an isolatable, independent, and active body part, were ingrained into modern reproductive science during its formative period in the eighteenth and early nineteenth centuries, and have continued to resonate in modern medical imaging and practices. To demonstrate this phenomenon, we combined methodologies from cultural studies and visual studies to determine how the uterus is viewed and treated in medical science. Ultimately, this historical analysis contextualizes present-day uterine imaging and its associated medical practices such as hysterectomies, surrogacy, uterine transplantations, and extracorporeal gestation.

Keywords: Cultural history, Medical imaging, Modern medicine, Pregnancy, Reproductive medicine

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Introduction

Making images is never a purely objective undertaking. Yet, contemporary medical images are often regarded as objective depictions—removed from observational subjectivities by the distancing of quantification and technological instrumentation—and therefore beyond the

considerations of visual and cultural analysis. Like any other image, medical images evoke a range of responses, convey layers of meanings, and are subjectable to interpretation and criticism as visual representations [For the widening of subject matter within visual studies, see Mitchell (2004)]. It is apparent that medical imaging participates in wider visual, scientific, and professional cultures that have continuities and traditions related to past socio-cultural concerns about the body and health. Indeed, to claim otherwise is to be ignorant of the

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social and cultural history of medical images. Cultures, particularly medical cultures, ascribed many different qualities to specific body parts. To demonstrate how antiquated medical ideas can be resonant within modern-day medicine, this article examines the images, meanings, and interventions associated with a single organ—the uterus.

Through the long history of gynecological and obstetrical traditions that extend back to antiquity, the uterus has been known by visual representation. However, this organ, like many body parts, is not a historically stable subject. For instance, between the early modern period and the present day, uteruses have undergone many quantifiable changes; the average age for the onset of menarche and menopause, rates of fecundity and birth, and the prevalence of uterine disorders and diseases. Early modern surgical and midwifery texts describe many uterine disorders and illnesses, including those related to cancer, menstruation, implantation, gestation, and labor, which clinicians now describe differently [Texts consulted include Gibson (1682), Bartholin and Chadwyck (1668), Pechey (1696), Chamberlayne (1698), Barret (1699), Mauriceau (1710), Dionis (1719), Mowbray (1724), Sharp (1725), Bracken (1737), Turner, Rivington, and Clarke (1742), van Deventer (1746), Pugh (1754), Astruc (1762), Memis (1765), and Smellie (1768). By way of example, seventeenth- and eighteenth-century authors typically described menarche as occurring at 15 or 16 years of age. Recent US national statistics given by the Centers for Disease Control and Prevention gives an average age for menarche of 12.5 years. For more on comparisons of menarche ages see Lehmann, Scheffler, and Hermanussen (2010) and Kronenberg, Williams, Melmed, Polonsky, and Larsen (2008)]. The kinds of medical interventions associated with uterine conditions have changed dramatically with such developments as anesthesia, sanitation, radiography, hormone therapy, antibiotics, minimally invasive surgery, assistive

reproduction technologies, and oral and intrauterine contraceptives. Ways of knowing about the uterus have also changed. However, the epistemological traditions of medicine reiterate and retain many of the uterine qualities known and taught by past medical authorities. Imaging has not only been central to changing perceptions of the uterus, but it has also encoded certain long-held notions and characteristics.

In early modern gynecological and obstetric medicine, the womb was often conceived of as an autonomous body part with special psychosomatic properties; in other words, the womb was thought to be self-willed and self-moving. By the nineteenth century, that theory had been discredited and was no longer explicitly taught in formal medical education. Yet, sentiments from the long-held and once-fundamental theory of an autonomous womb continued to linger in medical thinking and practice. The perspective that the uterus is an essentially active and problematic, but readily isolated and extractable organ persists in medical approaches and is an especially resilient, albeit little discussed, feature of modern uterine imaging. Recognizing the historical precedents of current medical imaging of the uterus is crucial to better understanding the possible subjectivities in current and future medical approaches pertaining to that body part, and especially such interventions as hysterectomies, surrogacy, uterine transplantations, and extracorporeal gestation.

Methods

Our analysis was conducted according to standard research practices in cultural history and visual studies. We undertook critical readings of a broad range of medical literature related to women's reproductive bodies and health, including obstetrical manuals, anatomical atlases, medical journals, and various kinds of cultural and social responses. The examination of literature and images revealed the trend in

medical understandings and visual depictions of the uterus from the mid-seventeenth century to the present day [This methodology is closely associated with that of Gilman (2018)]. Our transhistorical analysis of medical images is part of the “visual turn” now pursued and promoted within medical humanities scholarship (Johnstone, 2018).

Not wandering but autonomous: At the beginning of the professionalization of obstetrics and gynecology, a significant shift in the perception of the uterus occurred. The notion that the womb possesses its own volition and the capacity to move itself within the female body had long been a medical doctrine, dating at least as far back as the Hippocratic era. Scholars debated the existence of the so-called “wandering womb” until the eighteenth century. Even after that notion was put to rest, medical authors continued to use ideas about womb autonomy to explain problems in women’s bodies and various phenomena of generation, menstruation, passions, gestation, birth, and many diseases and disorders. Prior to the establishment of endocrinology in the mid-nineteenth century, and then, the discovery of hormones in the early twentieth century, several theories circulated about how the uterus affected the body and mind. For example, the womb could produce noxious vapors, press itself against the diaphragm, disrupt neural pathways, and release taints into the blood—any of which could impair a women’s health and psyche [Conversely, a women’s mind could influence the womb and, when gravid, the fetus (see Stafford, 1993)].

However, the womb was not merely a disorderly organ: it was seen as an independent creature. This idea was hotly debated in learned medical circles until the early eighteenth century. The widely esteemed Dutch professor of medicine and anatomy at Utrecht University, Isbrand van Diemerbroeck (1609-1674) was one such authority to voice his opinion on the matter.

It was, as van Diemerbroeck averred, too frequently believed that the womb “is mov’d of it self by its own proper Power” (1694, p.174). Even after a woman’s death, some believed that the womb could remain alive. More than residual nervous twitches in an otherwise lifeless body, the womb was thought to be “a Creature of it self, not living a Life common to the rest of the Body” (van Diemerbroeck, 1694, p.174). This perception of the womb as an autonomous creature related closely to a more general conception of women’s health, including pathologies like hysteria and *furor uterinus*, physiological explanations of sexual promiscuity, and theories about maternal-fetal interactions [For the history of these pathologies, see King (2004), Gilman, King, Porter, Rousseau and Showalter (1993), and Huet (1993)].

Anatomical studies flourished in Western Europe from the sixteenth to the nineteenth century. This science developed in step with innovations in graphic techniques and technologies, such as etching and mezzotint in printmaking or vascular injections and corrosion casting for anatomical preparations. The uterus—a medically important, but seemingly enigmatic internal organ—had a special appeal as an anatomical subject. In the late seventeenth and eighteenth centuries, the number of accoucheurs and man-midwives rapidly grew, as did the array of newly invented obstetrical tools and techniques [For man-midwifery, see Wilson (1995)]. These early stages of the medicalization of pregnancy and birth ushered in many new forms of visual representation of the uterus. Printed images of the uterus, like figure 1 from an English translation of van Diemerbroeck’s *Anatome corporis humani*, communicate both anatomical and physiological ideas, including references to the autonomous womb theory.

However, in mid-eighteenth-century London, which was then a leading center of science and medicine, the notion that the uterus was self-willed and independent

acting came under sharp criticism by Royal Society members and by Grub Street satirists alike [See Todd (1995) and Buckley (2017)]. Pathologies and phenomena previously caused by an unwieldy and willful uterus were increasingly explained in terms of nerves, psychology, and eventually hormones.



Figure 1. Various conformations of the womb in different stages of pregnancy by van Diemerbroeck (1694) [For example, fig.I is a gravid womb and fig.VII shows a non-gravid womb (courtesy of the Thomas Fisher Rare Book Library, University of Toronto).]

Yet, the autonomous womb idea left an indelible mark on the formative period of modern perceptions of the uterus and an enduring impression on medical education, visual technologies, and epistemological practices. William Hunter's *Anatomia uteri humani gravidi tabulis illustrata* [*The Anatomy of the Human Gravid Uterus Exhibited in Figures*] (1774) exemplifies the transition to a more recognizably modern anatomical illustration. The images in his atlas have a determined accuracy and bold stylistic

realism (Jordanova, 1989, 45-49). Many figurative elements common in earlier anatomical texts are stripped away. Yet certain aesthetic features, such as the inclusion of dissection tools and the statuesque poses of dismembered cadavers, are consistent with that era of anatomical images. The book's images focus on the uterus as the sole context—both visually and developmentally—for the embryo or fetus (Figure 2). Moving through the many arresting plates in Hunter's atlas, the uterus becomes an isolated body part with its own special qualities, in ways that no other body part has in anatomical illustration. Hunter's portrait-like engravings remained the foremost images of the uterus for many successive generations of medical practitioners. Although the wandering womb had then been discredited, a sense of autonomy and independence was fixed to the uterus by subsequent images such as these.

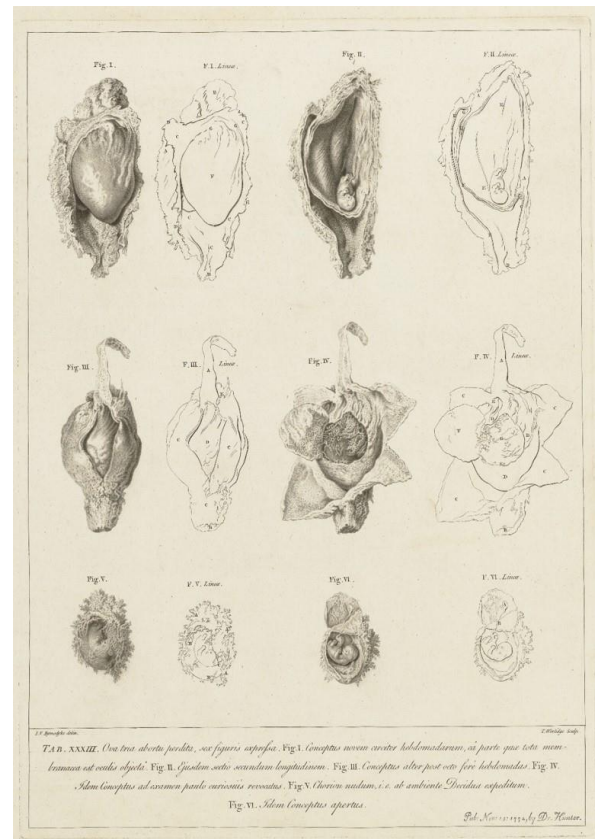


Figure 2. Six prosections of three fetuses demonstrating their position in the uterus and the

various layers of surrounding tissue (Hunter, 1774; Credit: Wellcome Collection. CC BY.)

Modern imaging: The earlier preoccupation with visualizing the uterus continued with twentieth-century imaging technologies such as radiography, ultrasonography, computer enhancements, magnetic resonance imaging, hysterosalpingogram, and endoscopy (Nicolson & Fleming, 2013, p.1). It is perhaps unsurprising, with consideration of the early modern history of uterine images, that “the uterus was one of the first organs to be examined by ultrasonography when ultrasound was introduced into clinical practice” (Mulic-Lutvica, Bekuretsion, Bakos, & Axelsson, 2001, p.491). Whereas early modern practitioners necessarily relied on touch as a primary means for determining the status of the fetus and womb [For prenatal diagnostic touch, see Pugh (1754)], and nineteenth-century practitioners added the stethoscope (Pinard horn or “fetoscope”) to their repertoire, ultrasonography has now become “the preferred imaging modality in the study of the female pelvis” (Derchi, Serafini, Gandolfo, Gandolfo, & Martinoli, 2001, p.2137). Earlier generations of anatomists had only the appearance of morbid uteruses vivified in illustrations; today, *in vivo* uterine imaging allows practitioners to view the uterus in real time. Yet, even with all the diagnostic and therapeutic advances brought about with these relatively recent technological innovations, perceptions of the uterus as active, isolatable, and pathological remain quietly embedded in modern uterine imaging.

A common sociological argument is that modern uterine imaging expresses androcentric tendencies or a “male gaze” inherent in professional medicine (see Hinze, 1999; Hoff, 1998; Silver, 2007, p.418). The female individual, as this criticism emphasizes, is routinely cropped out of uterine images and thereby marginalized. There are, of course, also technical limits and physical parameters at play. Modern visual technologies necessarily apply a discrete

visual field with precise borders around the uterus and its cavity. Fetal imaging typically includes the uterus, albeit as the context rather than the focal subject. Ultrasonographic scans have become routine since their clinical inception in the 1950s; having at least one ultrasonographic examination during pregnancy is now a normal obstetrical experience. Anthropologists Faye Ginsburg and Rayna Rapp (1999, p.279) suggest that through “widespread public deployment of sonogram imaging, fetal representations have become increasingly visible”. For example, the three-dimensional ultrasonogram in figure 3 is intended to demonstrate the status of the fetal subject. Yet, the uterus appears as the frame for the fetal image, thereby establishing the uterus, and not the whole woman, as the definitive environment for the conceptus. The inclusion of only the uterus in the fetal image is partly a technical constraint, but also a diagnostic convention used for observing features like the placenta, which functions as an essential nutritive and communicative conduit between fetus and mother. However, cultural expectations also underpin the inclusion of the uterus when imaging and viewing the unborn.

Imaging has created a widely recognizable fetal identity. The opportunity to treat the fetus as a patient, especially through surgical intervention, has also relied on imaging technologies. This visual power is now central to numerous political discussions in issues ranging from abortion, to parenthood, to embryonic stem cells (Casper, 1999, p.106). In fetal images, inclusion of the uterine wall often conveys a cradle-like aesthetic, which, in turn, adds an infant-like quality to the fetus. This is especially apparent in figure 3. Images such as three-dimensional reconstructions of fetal facial expressions allow parents, clinicians, and the public to see a fetal individual with accentuated personal attributes through a distinctive portraiture style (Hartouni, 1997, p.26-51). There is a long history to this kind of fetal

portraiture. Early modern images like figure 4 similarly animate the fetus as if a fully developed child (see Pranghofer, 2015, 167-194). In her study of early modern medical images of fetuses, art historian Lianne McTavish (2005, p.172-173) suggests that they “seem familiar to contemporary eyes because representations of fetuses detached from the maternal body proliferate in Western culture”. Indeed, one need only recall Lennart Nilsson’s iconic 1965 photo essay “Drama of Life before Birth” to see how this kind of image persisted (see Jülich, 2017). Throughout the visual history of the fetus, the uterus is regularly featured as the backdrop for the fetal individual. Physiologically speaking, the uterus and placenta are the intermediary between the fetus and mother. However, rather than an intermediary, the uterus in fetal images often appears as a boundary. The uterus is the definitive context or frame for the fetus in these images, and therefore, stands in for the woman’s body, as if that one organ was independently responsible for gestation. As these criticisms highlight, the uterus has assumed a highly symbolic role within fetal imaging.



Figure 3. A three-dimensional ultrasonographic image of a nine-week gestational age fetus (© R. A. Pierson)

Uterine activity: The idea that the uterus is quintessentially active endures in reproductive medicine. Far from a wanton creature wandering within the female body, present-day discussions of uterine activity include electro-physiological properties,

cellular structure, and neural or hormonal messengers effecting uterine musculature as well as glandular and vascular changes in mucosal tissue.

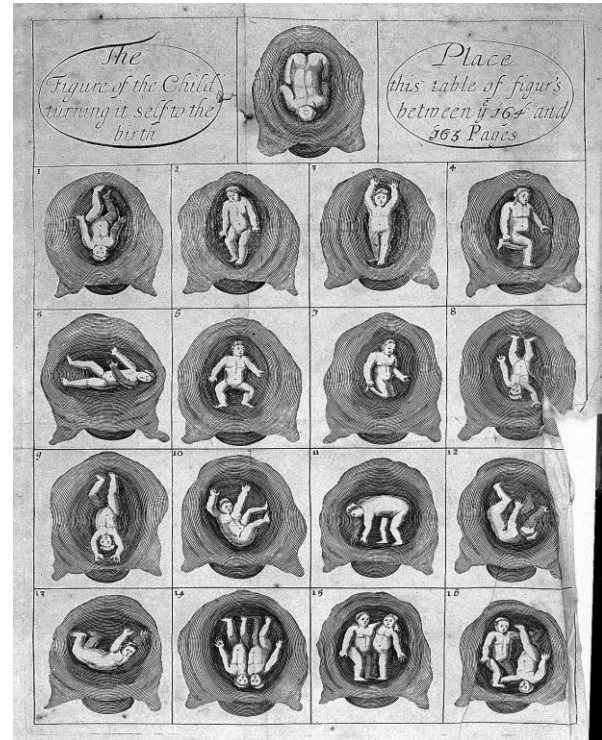


Figure 4. Various fetal positions demonstrated in a late-seventeenth-century surgical treatise (Cooke, 1685; Credit: Wellcome Collection. CC BY.)

Pathologies that result from inappropriate or abnormal uterine activity include dysmenorrhea, endometriosis, polyps, fibroids, and fecundity disorders. For instance, studies have tried to determine the normalcy of uterine activity by using topographic measurements to differentiate between what is “normal from the physiological point of view” and the “medical diagnostics point of view” (Oczeretko, Kitlas, Borowska, Swiatecka, & Laudanski, 2007, p.50). Visual imaging is essential for hypothesis testing, and measuring and documenting such uterine activity. Other studies have measured uterine activity during genital stimulation and orgasm using real-time ultrasonography, thereby showing the uterus’ involvement in sexual pleasure (Figure 5). Technologies like

hysterosalpingography, hysterosalpingo-contrast ultrasonography and laparoscopy can be used to show the role of uterine movements in the transport of spermatozoa from the cervix towards the fallopian tubes (Zervomanolakis et al., 2007, p.1-20). Magnetic resonance imaging has also been crucial to investigating the poorly understood peristaltic motions of the uterus (Kido et al., 2007, p.1813-1819; see figure 6). Common to these studies is the idea of a scientific observer capturing the cryptic uterus in the act or, rather, in action.

There is continuing research into the singular activity of the uterus. For instance, researchers examining the mechanisms of labor initiation and uterine activity are still elucidating the importance of prostaglandins (Fuchs, Fuchs, Husslein, Soloff, & Fernstrom, 1982; Jenkin & Young, 2004; Vidaeff & Ramin, 2008; Sugimoto, Inazumi, & Tsuchiya, 2015). This group of lipid hormones causes varied physiological responses, particularly vasodilation and vasoconstriction, and has a significant role in uterine contractions, cervical ripening, and ultimately, parturition. Ambiguity still surrounds the dynamics of spontaneous uterine activity as normal or abnormal, and the influence that the mother's mind has on conception, nidation, maternal recognition of pregnancy, gestation, and labor. Notions of an inherently active uterus are still at the fore of medical and scientific study and continue to rely greatly on visual

imaging. Indeed, these research programs examining uterine activity can trace their roots back to enlightenment anatomists investigating the movements of the wandering womb.

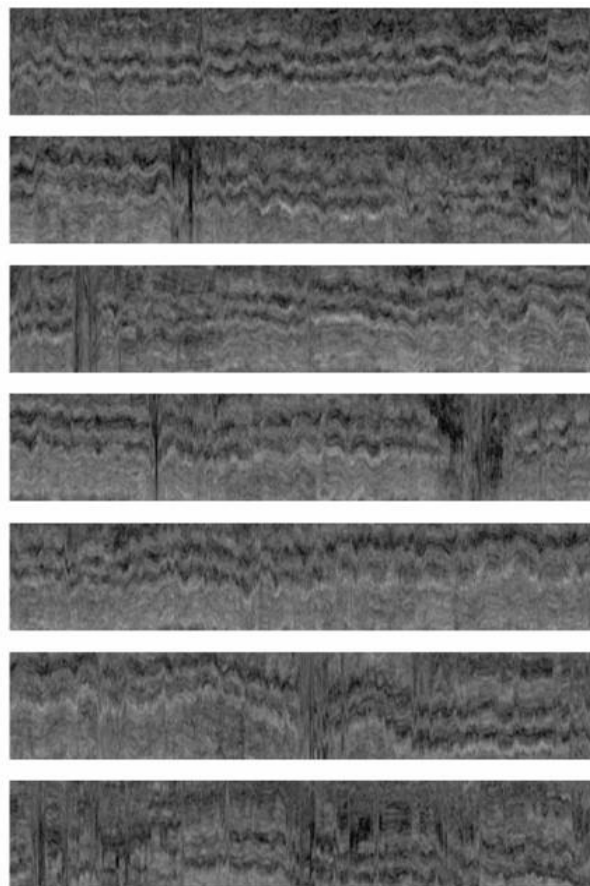


Figure 5. Concatenated time series data lines from continuous real-time ultrasonographic images of contractile activity in the lining of the uterus during sexual arousal and orgasm (© R. A. Pierson)

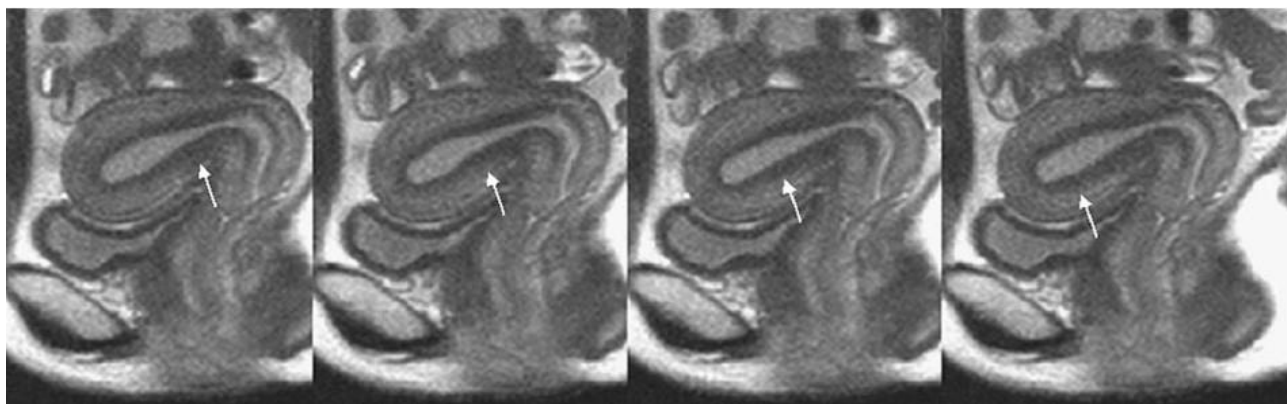


Figure 6. Four serial Half-Fourier Acquisition Single-Shot Turbo Spin-Echo (HASTE) magnetic resonance images of the midsagittal uterine plane of a healthy individual during the periovulatory phase [The arrow indicates a peristaltic contraction moving from the cervix to the fundus (Kido et al., 2007).]

Isolation and extraction: hysterectomies, surrogacy, uterine transplants, and ectogenesis: Medical techniques of hysterectomy, gestational surrogacy, uterine transplantation, and imaging conceptually and procedurally disunite the uterus from the body, consequently perpetuating a sense of the uterus as readily isolatable and extractable. Now one of the most common surgical procedures, hysterectomies are a typical treatment for ailments like cancers, dysfunctional uterine bleeding in peri- or postmenopausal women, and as a prophylactic measure to obviate those diseases, especially once reproductive function is deemed no longer pertinent. Uterine imaging plays an essential role in these extractions. For example, ultrasonograms are used to assess the risk of uterine cancers. Medical diagnostic images isolate the uterus as the visual and pathological subject; following assessment, subsequent therapeutic measures frequently involve total extraction (Nezhat, Nezhat, Gordon, & Wilkins, 1992, p.39).

Such procedures reflect a perception of the uterus as disorderly, but excisable. However, that perception and the associated medical procedures come at a cost. Women who have had their uterus removed can experience an altered gender identity. Many women have concerns similar in sentiment to one patient who felt that she “wouldn’t feel like a whole woman without her uterus” (Dwyer, Cerfolio, Murray, & Rosenthal, 1996, p.29). As this woman’s comment suggests, the uterus can be a powerful and dear symbol of gender, womanhood, and sexuality. In recent years, attention to the non-pathogenic significance of the uterus, such as its social and personal value, has informed the public, and thus, reduced the trend toward invasive treatment options and caused a marked decrease in rates of hysterectomies performed in the US (Wright et al., 2013). Non-vital and problematic, but dearly valued, the uterus’ reproductive and social role is at odds with its worrisome potential

for disease.

Transplanting a functional uterus or creating an artificial uterus presses even further the conceptualization of the uterus as a moveable, replaceable, and self-contained reproductive organ. Therapeutic human uterus transplantations are reserved for cases of absolute uterine infertility (Pearson, 2007; Grynberg, Ayoubi, Bulletti, Frydman, & Fanchin, 2011). The first human uterine transplant was performed in Saudi Arabia in 2000, although the donor uterus had to be removed after 99 days due to a threatening blood clot (Fageeh, Raffa, Jabbad, & Marzouki, 2002, p.245-251). The first uterine transplantation with a subsequent successful livebirth was carried out in 2013 at Sahlgrenska University Hospital, Gothenburg, Sweden (Brannstrom et al., 2015). Uterine transplantations are also a hypothetical consideration for male recipients (Caplan, Perry, Lauren, Joseph, & Frances, 2007, p.19). However, uterine transplants might not be needed to realize a male pregnancy and birth [For male pregnancy and birth in the early modern period, see Velasco (2006)]. Individuals who have undergone female-to-male gender transitions may conceive, carry, and deliver. One highly publicized case is that of Thomas Beatie, who underwent partial gender reassignment surgery and hormone therapy to be identified as a man (see Landau, 2012; Shapiro, 2015, p.236-243). Using assisted reproductive technologies, Beatie was eventually able to successfully deliver three infants.

The practice of surrogacy—whether genetic, gestational, or both—further complicates the association between maternal identity and uterine function. Gestational surrogacy involves the transfer of an embryo into the carrier’s uterus, whereas genetic surrogacy or genetic and gestational surrogacy involves a donation of an egg as well. The premise of commercial surrogacy is that the genetic parents are essentially renting the womb of the surrogate mother. Gestational surrogacy agreements assume

that parenthood of the conceptus is entirely based on genetic contribution, consequently, discounting the developmental and relational role of gestation. The notion that the womb is an independent space or preserve within the carrier's body is a foundational precept of gestational surrogacy. Yet, surrogacy also affirms the necessity of the uterus.

Ectogenesis, literally "outside birth", dissolves the solely female proprietorship of gestation, makes redundant human uteruses, and advances the idea that the womb is a self-contained and disembodied reproductive unit (see Bulletti, Palagiano, Pace, Cerni, Borini, & de Ziegler, 2011). It has been suggested by bio-ethicist Stephen Coleman (2004, p.1) that such technology would be actualized "some time in the not too distant future". Even though several other established assisted reproductive technologies already make redundant the *natural* reproductive role of certain male and female sex organs, ectogenesis represents a profound challenge to the conventional meanings of reproduction and especially those ascribed to the uterus. With ectogenesis, the uterus is no longer requisite as an intermediary for intrapersonal nurturing and bonding with the fetus. More than simply removing the organ from the body, ectogenesis effectively transposes the gestational qualities *ex corpus*, replacing the uterus' primary biological function. Yet, in the meantime, the womb has accrued a greater ethical and moral significance. Nicholas Agar (2007) suggests that since new technologies can be used to replace several reproductive processes, including coitus, fertilization, and the very early or later stages of gestation, the uterus is now positioned as a uniquely irreplaceable biological component of reproduction – at least for the time being.

Ectogenesis will be perhaps the ultimate realization of the autonomous womb. Modern discussions of *ex vivo* conception and gestation engage with a long tradition of imagining the womb separate from the woman (see Haraway, 2000). These kinds of

notions hark back to such mythical births as Bacchus, Erichthonius, and Orion. In the sixteenth century, the Swiss physician Paracelsus proposed an alchemist recipe for gestating babies (see Cobb, 2007, p.19). More than two centuries later, a treatise called *The Man-Plant: or, Scheme for Increasing and Improving the British Breed* (1752) published under a probable pseudonym made a mockery of the emergent science of reproduction and the physicians, man-midwives, and natural philosophers who busied themselves with such studies. The plot of the satire is the invention of an artificial womb and discovery of a technique for "the Extraction of the Egg, or Human-fœtus, in order to its Transplantation" into that womb (p.20) (This is one of the earliest uses of "transplantation" to mean a surgical procedure.). Although intended as a farcical affront to the medical profession, *The Man-Plant* connects ideas about autonomous wombs, assisted reproductive technology, ectogenesis, and gender in ways that are now gaining real-world relevance. Recently, another advance has been reported in developing an extracorporeal system for gestation "that closely reproduces the environment of the womb" (Partridge et al., 2017, p.1). The research team based at The Children's Hospital of Philadelphia Research Institute transferred fetal lambs into the extrauterine device and successfully gestated them for up to four weeks. The envisioned clinical device for extremely premature human fetuses would "be designed with many features that should allow the parent to be connected with the fetus including ultrasound, a darkfield camera allowing real-time visualization of the fetus within its darkened environment and the ability to play maternal heart and abdominal sounds to the fetus" (p.9). Even with artificial wombs, imaging will remain integral to knowing the fetus and experiencing reproduction.

Concluding remarks: Medical imaging has an ever-expanding array of available technologies capable of displaying more

about the uterus and its contents. However, such medical practices and images silently carry past ideas and meanings. The sense that the uterus is an inherently active, easily isolatable, and especially problematic body part was ingrained in scientific theories, surgical approaches, and visualization techniques at the beginning of modern professional medicine. Eighteenth-century practitioners and anatomists had scrutinized, debunked, and discarded the notion of the wandering womb. Yet, elements of the uterus' perceived autonomy remain resonant in medical thinking and procedures today. Several conflicting meanings are affixed to the uterus; it is a gender-specific, virtually irreplaceable, and disease-prone organ that has long been viewed as distinct and readily excisable from the female body. Such medical perceptions have long influenced diagnostics and therapeutics. These different meanings of the uterus are being continually challenged and changed. Only by looking back at the lineage of ideas, technologies, and practices can we accurately delineate current and future medical perspectives on reproductive processes and body parts, like the uterus.

Conflict of Interests

Authors have no conflict of interests.

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