Chapter 1

Porous Bodies, Impressible Mothers

A Global and *Longue Durée* Perspective

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1.1 Introduction

To contextualise present biomedical debates on the role of pregnancy in shaping offspring traits, and hence the related notion of maternal responsibility, we review in this chapter the prehistory of the belief in maternal impression. Maternal impression is the enduring notion that the emotions and experiences of a pregnant woman could leave permanent marks on her unborn child. We are not claiming in the following pages that maternal impression, or its historical understanding, is a direct predecessor of the Developmental Origins of Health and Disease (DOHaD). However, with this global historical overview, moving eastward from the Mediterranean to Asian medical systems, we are alerting the reader to the ubiquitous pre-scientific concern with pregnancy, and sometimes pre-pregnancy, as a key time 'requiring self-discipline and work on the part of expectant mothers' [1]. As DOHaD globalises its research and claims about novel forms of soft inheritance [2] to geographical regions that encompass a multiplicity of knowledge systems, this *longue durée* and global view of maternal effects may help understand both its resonance with traditional beliefs in the West and contemporary forms of hybridisation with non-Western systems of medical knowledge, which we will discuss in Section 1.4.

1.2 Maternal Impressions in Europe before Modern Medicine

1.2.1 Greco-Roman and Medieval Medicine

In describing the relevance of maternal impressions in Greco-Roman and Latin medieval medicine, it is important to highlight three major aspects. First is the wider experience of the pre-modern body as a permeable and porous entity, living in a state of *constant apprehension* of the external environment on its physiological balance. Second is the physical power of imagination. Before the modern split between body and mind, a fully materialistic view prevailed in pre-modern medicine where the soul and human temperament were seen as mostly determined by the physical impact of changes in diet, climate, or through the effects of planets' movement. This deep communication between imagination and bodily changes may seem superstitious or only metaphorical in the post-Enlightenment mindset, which neatly separates inwardness and external objects, but it was literal and effective well into early modernity [3]. Scholastic philosophers, for instance, shared the notion that mental images could impress real forms into matter. Al-Kindi (ninth

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century CE), one of the fathers of Islamic philosophy known in the Latin West for his On Rays (De Radiis) and a translator of Aristotle, held the view that any spiritual substance can induce true forms in the body just through imagination [4, 5]. This widespread understanding of the relationship between matter and mind offers a context to appreciate the impact and ubiquity of the doctrine of maternal impression or the belief that a mother's imagination could imprint both physical and mental characteristics on an unborn child.

Third is the gendering of biological knowledge, at different degrees, in both medical and philosophical views of reproduction. Physiologically, in Greco-Roman and later medieval medicine, it was widely assumed that women were of a softer, more permeable, and less stable nature, more liquid and transparent than men, and hence easily subject to passion [6]. This perceived greater impressionability of the female body finds its validation earlier in Hippocratic texts, where women are considered spongier, 'with a capacity to absorb fluid which makes it directly analogous to wool or sheepskin' [6]. These and other tropes were instrumental in consolidating the image of women as more subject to passions and less shielded 'against corrupting ingestions' [1]. These ingestions included the power of imagination and the susceptibility to several social influences that we would now call shocks or traumas. As we can read in the most influential treatise in female medicine in antiquity, Soranus' *Gynecology* (*c.*125 CE):

> Some women, seeing monkeys during intercourse, have borne children resembling monkeys. The tyrant of the Cyprians who was misshapen, compelled his wife to look at beautiful statues during intercourse and became the father of well-shaped children; and horsebreeders, during covering, place noble horses before the mares. Thus, in order that the off spring may not be rendered misshapen, women must be sober during coitus because in drunkenness the soul becomes the victim of strange fantasies; this furthermore, because the off spring bears some resemblance to the mother as well, not only in body but in soul.

A treatise attributed to Galen [7] enlists the perceived ability of an expectant mother to imprint her child as one of the many 'wonderful works of nature'. The Aristotelian view is even more radically gendered. Whereas the Hippocratic and Galenic tradition sees both men and women as contributing to semen for procreation, for the most influential philosophers of antiquity until early modernity, women contribute only bare matter to the male semen that will inform and shape the female menses. Medieval medicine and natural philosophy would rework these tropes with a few variations. Women being not just less hot but also of a more watery constitution than men, Albert the Great and Thomas Aquinas thought that they would behave as any moist object would: that is, they would receive impressions more 'easily but retain them poorly' [8]. In a moralising rendering of this trope, Albert the Great instead made the claim that the mud-like impressionability of women could explain why 'women are more inconstant and fickle than men' [9]. Their moister constitution made women more easily subject, for instance, to the effects of lunar tides. Throughout the European Middle Ages and into early modern Europe, maternal impression was debated as one of the key environmental influences to explain the specific characteristics of the child, particularly birth defects or the resemblance (or lack of) to the father [10, 11]. The emphasis remained on the negative, and the avoidance of scary sights or stressful emotions was largely advised in the medical literature as a way to counteract the power of a porous womb.

1.2.2 Early Modern European Debates 1500–1700

Maternal impression, and particularly one racialised version of it possibly based on the Hippocratic 'On the Nature of Children' [12], became widespread in the Renaissance and

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early modern Europe (see [13]). In the medical-teratological work of Ambroise Paré (*Des monstres et prodiges*, 1573), Hippocrates was said to have saved a white princess from the accusation of adultery when she mothered a child 'black as a Moor'. The father of medicine pronounced that a portrait of a Moor in the princess's bedroom was to blame for the case of dissimilarity in generation. (For the racialised aspect of maternal imagination, see [12].) Besides Paré's teratology, a belief in maternal impression was shared by a large number of European intellectuals and doctors of this period from Ficino to Montaigne and Gassendi [14]. Paracelsus claimed that 'the woman is the artist and the child the canvas on which to raise the work' (cited in [15]); Montaigne claimed that 'we know by experience that women transmit marks of their fancies to the bodies of the children they carry in the womb' (cited in [16]).

The seventeenth century saw a progressive collapse of the fluid body of humoralism in favour of an organic understanding of physiology and the fading of teleological explanations replaced by emerging mechanistic science. Maternal impression, however, still found a place in debates on reproduction and heredity. Rather than just being confined to teratological abnormalities, the power of imagination was integrated as another mechanism for explaining resemblance among generations [17]. For this reason, the alleged power of maternal impression was often resisted and criticised by scholars who highlighted instead the stability of natural processes and their relative impermeability to the direct effect of accidents or emotions [18].

Although scientific debates became more cautious in connecting abnormalities to maternal misconceptions, seventeenth- and eighteenth-century medical and midwifery texts, both technical and popular, continued to offer harsh prescriptions to control pregnant women. Unknowingly building on old humoralist tropes of maternal permeability, they taught women that their wombs were sensitive to the external world 'as our senses are' and that 'whatsoever moves the faculties of the mother souls may do like in the child' [19]. John Maubray, in his influential treatise *The Female Physician* (1724), also claimed that when the soul is 'elevated and inflamed with a fervent Imagination, it may not only affect its proper Body, but also that of Another'. Therefore, pregnant women were encouraged to 'suppress all Anger, Passion, and other Perturbations of Mind, and avoid entertaining too serious or melancholic Thoughts; since all such tend to impress a Depravity of Nature upon the Infant's Mind, and Deformity on its Body' (1724 cited in [20]).

1.3 The Middle East: Biblical, Talmudic, and Arabic Commentaries on Maternal Impression

1.3.1 Pre-eugenic Thinking in the Biblical and Talmudic Tradition

Moving to the East Mediterranean and what is today the Middle East, we can see how tropes around maternal impression often took a different form within debates on paternal and maternal power to shape heredity. In the Jewish tradition, for instance, what emerges more vividly is the possibility to control and optimise reproduction through impressions, particularly at the time of conception rather than during the whole pregnancy. The *Torah* offers a clear and oft-cited example. Jacob, the grandson of Abraham, uses something akin to maternal impressions to generate spotted sheep. Genesis (30, 37–39) says:

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> Jacob, however, took fresh-cut branches from poplar, almond and plane trees and made white stripes on them by peeling the bark and exposing the white inner wood of the branches (38). Then he placed the peeled branches in all the watering troughs, so that they would be directly in front of the flocks when they came to drink. When the flocks were in heat and came to drink, (39) they mated in front of the branches. And they bore young that were streaked or speckled or spotted [21].

While Midrashic disputes or Talmudic commentaries refer to this episode to exonerate white mothers having a black child or vice versa [22–24], in later rabbinic commentaries (14th CE) the passage in Genesis is taken as a platform to suggest a positive possibility of control of heredity among humans:

> If animals, who have no intelligence to understand the benefit of a matter or its detriment, and only act out of instinct, have the power to mold their offspring according to their thoughts at the time of copulation, how much more so for human beings, who have great power of intellect to form in their minds perceptions of matters lofty and mundane, and they have the power to direct their thoughts with regard to any given matter, that they need to purify their thoughts for this endeavor [25]

An interesting albeit anecdotal variation to this quasi-eugenic theme (in the sense of better birth) can be found in a story about the famous Rabbi Yohanan (first century) who apparently justified to other rabbis his frequent attendance of Roman public bathhouses by claiming that 'the sight of his physical beauty' would cause women who 'washed before intimacies with their husbands . . . to conceive handsome children' [26]. The focus on preventing negative effects, instead, is highlighted by a story in the Talmud of the anxious precaution of a rabbi who only made love to his wife in darkness, so that at the moment of copulation he would not set his eyes on another woman 'begetting sons who are as bastards' (cited in [12]). At least in this case, it is the man and not the woman the possible channel through which impressions or emotions may shape a child's nature.

Finally, Moses Maimonides' work (1135–1204) also emphasises the potential usage of maternal impression to achieve a good or better birth. In his medical aphorisms on Greco-Roman medicine, he writes [7]:

> (xxiv.26b) I was informed about an ancient physician that he wished to have a fair son born to him and that he painted a portrait on the wall of a boy as handsome as possible. When he had sexual intercourse with his wife, he ordered her to look at that portrait constantly and not to look away from it even for a short moment. She got a son who was as beautiful as that portrait but did not resemble his father [12, 27].

1.3.2 Muslim Medical Views in the Middle Ages

Medical views in Islam are influenced by four parallel and somehow competing if not conflicting sources and traditions: the Greco (Unani)-Islamic tradition (Avicenna, Al-Razi, etc.); Aristotle's highly influential view of generation and reproduction as determined mostly or only by the power of the male semen to control a recalcitrant maternal matter; Prophetic medicine (medical sayings attributed to Muhammad, which were later turned to a whole discipline); and 'spiritual' saintly healing. References to maternal impression are, however, somehow more contained. Key medical sources from the tenth and eleventh centuries – Al-Qurtubi, al-Rāzī, and Ibn Sina – are more worried about possible miscarriages caused by frightening emotions in women (or undue movement) than maternal impression or influence on the child morphology as such (see, for

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instance, [28]). Two peculiar aspects of Islamic culture may have deflected the medical view on impressions. One is that the Islamic ban on portraits and statues at home limits the number of eccentric sights (mostly outdoor sights such as animals) (see [29]) that could influence a woman [22]. The diminished impact of images is balanced by a stronger emphasis on smell. According to Ibn Sina, women could abort due to particular smells such as an extinguished candle. And if the smell of some peculiar food generated a craving that was not satisfied immediately, this would lead to a proverbial birthmark (in the shape of the food) or crossed eyes, a punitive sign that not enough attention has been paid to a mother's desire. As commentators noticed, a penalty applied to all tenants of a building if a maternal craving caused by smelling food was not satisfied, illuminating the attention and care that should be reserved for pregnant women under Islamic rules [28].

The second peculiarity of Islamic commentaries is their emphasis on a less *permeable* view of heredity that somehow 'resembles' a contemporary understanding. Indeed, Islamic medieval commentators developed a specific understanding of heredity that sidelined the direct power of impression and instead highlighted how 'traits from distant relatives may skip generations and then suddenly appear in subsequent offspring' [22].

This is important to highlight to avoid a too-deterministic view of direct maternal effects as a ubiquitous monolith in pre-modern traditions. Besides medical advice such as the work of the Persian physician *Ali ibn Sahl Rabban al-Tabari* (d. 870) in his *Firdaws al-Hikma* (*Paradise of Wisdom*), similar notions can be found in the saying of the prophet Muhammad who explicitly advised fathers not to disown sons who look nothing like them because children frequently receive hereditary traits (*naj'a 'irq*) from distant ancestors, just as red camels oftentimes produce ashy-coloured offspring that resemble prior relatives [22]. This is less to attribute to the Prophet a Mendelian view of heredity and more to highlight sociological pressures to avoid a too-easy dismissal of paternal responsibility from men and hence the risk of disintegration of the family [22].

This is not to say that in medieval Islamic medicine there is no emphasis on and hence anxiety about direct environmental influences on the act of procreation and accordingly the quality of birth. Tenth-century embryological debates (Arıb ibn Sad (d. 980), in his *Kita¯b khalq al-janı¯n* (*Creation of the Embryo*)) are ripe with precautions about the presence of certain winds during coitus that may produce lazier or more delicate children, the importance of maternal and paternal mood at the moment of procreation (a happy soul strengthens the body, and a stronger body gives rise to more robust sperm), or avoiding intercourse with women who had refrained from sex for a long time [22]. Both Islamic and Jewish medical traditions present different interpretations of maternal impressions developing out of their specific religious contexts. A shared similarity is the importance placed on the various senses at the time of conception to optimise reproduction, and a framing within legal-theological debates, while references to licit and illicit sexual intercourse and a patriarchal anxiety to control female desire are in continuity with the Greco-Roman experience.

1.4 Eastern Medical Traditions and Fetal Education

Eastern medical traditions, such as Ayurveda in India and traditional Chinese and Japanese medicines, share similar albeit differing perspectives on the mother's ability to influence her child in the womb. Instead of a focus on maternal impressions as seen previously, however, these traditions developed the concept of 'fetal education' or the ability to educate or influence the child from within the womb. The ideas expressed in

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fetal education have strong roots in ancient texts and beliefs and work to create positive and avoid negative influences on the fetus. Both Ayurveda and Chinese medicine continue as traditional therapeutic medical systems today, unlike European humoralism discussed previously [30], and various forms of fetal education continue to be practiced contemporarily (see [31, 32]). While Ayurveda draws on Hindu moral ideas and a specific medical framework, Chinese and Japanese medicine share very similar resemblances and largely rely on Confucian doctrines.

1.4.1 Garbh Sanskar: Ayurvedic Education in the Womb

The concept of fetal education in Ayurveda is often evoked by the tragic hero Abhimanyu from the Indian classic the *Mahabharata*. In this epic, Abhimanyu learns how to enter an impenetrable city while within his mother's womb [33]. Hindu myths express ideas about maternal impressions during conception or even prior to conception (see [12]). In Ayurvedic medicine, *Garbh Sanskar*, commonly translated as 'education in the womb', prescribes a regime for both men and women to conceive and birth a healthy child. *Garbh Sanskar* interestingly has cited the preconception period as a key component to producing healthy children and advises a variety of purification procedures and timings to ensure good-quality progeny. The focus is not solely on women, and men are included in the procedures and are thought to play an important role in conception.

The classical text, the *Charaka Samhita* explains how at conception the embryo is created by three factors: the mother, the father, and 'the self' or 'life'. All three components are said to influence different organs and dispositions of the child [34]. Here, maternal and paternal health both play an important role before conception, and men are required to undertake actions to produce good-quality semen. Semen, in classical Ayurvedic medicine, is viewed as the 'highest essence' generated by the body [34]. Invoking an agricultural metaphor, the *Caraka Samihita* describes the need to prepare for pregnancy: 'As seed (of a plant) does not sprout if affected by improper time, water, worms, insects and fire, so is the defective semen of man' [35]. For women, menstrual blood plays a similar, but not equivalent, role to semen and is a generative fluid that unites with semen at conception [34]. After the time of conception, the focus shifts to the mother and her actions, behaviours, and nutrition.

1.4.2 Taijiao and Taikyō: Fetal Education in Chinese and Japanese Medicine

Classical Chinese medicine incorporates the cosmology of Yin and Yang. Yin is representative of qualities such as 'darkness, cold, moisture . . . the moon, the night and the feminine'. Yang is representative of the qualities of 'brightness, the sun, fire, warmth, activity and the masculine principle'. Yin and Yang were seen to regulate the bodily *qi* (fundamental energy) and any changes in the body [30]. In medieval China, the concept of fetal education reflected a particular interconnection between the womb and external stimuli. The sex of the child, for instance, was thought to be malleable during this indeterminate time, and the responsibility for the outcome rested upon the mother's conduct [30]. For instance, in Song Dynasty texts, such as the *Fu Ren Da Quan Liang Fang* (*A Great Complete Collection of Fine Formulas for Women*) (1237 CE), the mother's actions are described as impacting the attractiveness or intelligence of the child:

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> The child during the first trimester is called the initial fetus. This is the period during which the infant begins to be moulded. If a dignified and elegant stature is desire, the mother should think, speak, and act discretely. If a handsome offspring is wanted, she should wear a piece of jade. If a witty offspring is desired, she should read verses and poems. This is because the exterior reception communicates with the interior plasticity. [36]

Taijiao or 'fetal education' (literally *tai* [fetus] and *jiao* [to instruct]) has roots in the classical text the *Senior Dai's Book of Rites* (*Da Dai Liji*) and was later expanded upon by Liu Xiang (ca. 80–7 BCE), a Han Dynasty Confucian scholar, who claimed that the integrity of kings rested on the morality of their mothers [37]. It has been part of Chinese gynaecology for centuries and returned periodically to prominence at certain historical junctures of Chinese stories, such as the early Republican era from the 1910s. Often, the specific nature of training in the womb reflected the importance of moral transformation within Confucianism and the wider belief that the outside environment could influence the developing fetus. Here, the fetus is responsive to stimuli provided by the mother through her senses, behaviour, emotions, and environment. Taboos, such as not eating or looking at rabbits (which would result in the child developing a harelip), reflect the belief in the ability of the fetus to absorb outside stimuli and incorporate them physically into their own developing body [37].

The influence of the environment on the child is expanded in Japanese fetal education or *Taikyō* to include both parents and the wider society. *Taikyō* was introduced to Japan from China in the tenth century and, like Chinese medicine, was strongly influenced by Confucian ideas [38, 39]. In Japanese, *Taikyō* translates to 'womb teaching' and could be interpreted as teaching the pregnant woman or the fetus within the womb. Originally, the belief was that if a pregnant woman behaved appropriately, she would birth a man of great virtue [38]. Other texts such as the *Onna chōhōki* or *The Record of Women's Great Treasures*, written by Namura Jōhaku in seventeenth-century Japan, show the progression of these beliefs and give an insight into ideas of pregnancy during the Edo period. Namura's recommendations on *Taikyō* included wrapping the belly, prescribing types of food, and producing an ideal environment to bring about an uneventful birth and the health of the child [40].

1.5 Conclusion

Global history has emerged in the last two decades as an attempt to decentre Euro-Atlantic routes of trade, power, and science, as the main site of knowledge production [42]. Through a review of primary and secondary sources about maternal impression from the Mediterranean to China before the rise of modern science, in this chapter we have aimed to contribute to debates on the global history of the permeable body across different cultural and medical contexts. Focusing on a time where there is no technological or scientific gap between East and West is particularly fertile because it avoids the narrative of the diffusion of Western science. It suggests instead circulation, 'connected histories', and networks of exchange across Afro-Eurasia [43, 44]. As the following chapter will show, the trope of maternal impression declined with the rise of modern science, and genetics in particular, but not the emphasis on the maternal body as a site for optimising reproduction and monitoring a mother's behaviour before and during pregnancy. Eighteenth-century embryological debates [41, 45], the rise of 'pre-natal culture' in nineteenth-century European science [46], and more recently, the growing interest in mother–fetal interaction and maternal 'imprint' [51] can undoubtedly be

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linked with several immediate causes in medical, scientific, and technological changes. In particular, the last half-century changes in Euro-American biomedicine have led to a new visibility and agency of the fetus within a technologically transparent maternal body [47–50]. This chapter has aimed to show that whatever their present iterations and more immediate genealogies, contemporary postgenomic findings – and their related notions of risk, responsibility, gendering of biological knowledge, and blame or optimisation – are not solely a modern invention and have a much wider global and historical resonance. Contemporary scientific labs did not emerge in a historical vacuum but are embedded in sociocultural contexts in which pre-comprehensions of the maternal body as uniquely transparent and impressionable, and hence subject to control and governance, have a long prehistory.

A good example of the persistence and hybridisation of *longue durée* beliefs with contemporary science comes from India. Newspaper articles have reported on specialised ashram-style clinics that have claimed to use the practice of *Garbh Sanskar* not only to help parents conceive and produce healthy children but to also perfect the reproduction process. Some institutions claim that they can help couples produce the 'perfect progeny' or even 'upgrade' or 'repair' dysfunctional genes [31]. It has been suggested that by utilising the knowledge and practices of *Garbh Sanskar*, epigenetic programming can take place and help create healthier offspring [52]. Articles have likened the practice to a modern version of 'genetic engineering' [31]. The practice of *Garbh Sanskar* has also found space in the digital sphere in India with apps, online workshops, webinars, and music advertised to help women increase the likelihood of producing healthy and intelligent children. These trading zones exemplify the globalisation and commercialisation of traditional medical knowledge and ideas about the pre-pregnant and pregnant body. The example of Garbh Sanskar illuminates how the circulation of epigenetic ideas across the world is neither uniform nor bound by bioscience and can be adapted and entangled with pre-existing notions of maternal imprinting and responsibility. As DOHaD develops and expands globally, these entanglements will become important to assess how epigenetic knowledge is being (re)produced in localised contexts. An invitation to look at history not just as a succession of novel discoveries but also as the long-term accretion and sedimentation of mentalities across a long historical time will be helpful for DOHaD scholars and practitioners to situate their work in context.

References

1. Kukla R. Mass Hysteria: Medicine, Culture, and Mothers' Bodies. Lanham: Rowman & Littlefield Publishers; 2005.
2. Hanson MA, Low FM, Gluckman PD. Epigenetic Epidemiology: The Rebirth of Soft Inheritance. Ann Nutr Metab. 2011;58(Suppl. 2):8–15.
3. Kirmayer L. Toward a Medicine of the Imagination. New Lit Hist. 2006 Jun 1;37:583–601.
4. Zambelli P. The Spéculum Astronomiae and Its Enigma: Astrology, Theology and Science in Albertus Magnus and His Contemporaries. Berlin: Springer; 1992. 352 p. (Boston studies in the philosophy of science).
5. al-Kindi Adamson P. In: Zalta EN, editor. The Stanford Encyclopedia of Philosophy [Internet]. Spring 2020. Metaphysics Research Lab, Stanford University; 2020 [cited 2022 Mar 29]. Available from: https://plato.stanford.edu/archives/spr2020/entries/al-kindi/
6. Helen King. Hippocrates' Woman : Reading the Female Body in Ancient Greece [Internet]. London: Routledge;

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1998 [cited 2021 Oct 27]. Available from: https://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=60796&site=eds-live&scope=site

7. Leigh R. On Theriac to Piso, Attributed to Galen: A Critical Edition with Translation and Commentary [Internet]. Leiden: Brill; 2015 [cited 2022 Apr 4]. Available from: https://brill.com/view/title/32249
8. Aquinas T. The Essential Aquinas: Writings on Philosophy, Religion, and Society [Internet]. Westport: Greenwood Publishing Group; 2002 [cited 2022 Mar 29]. 248 p. Available from: www.abc-clio.com/products/c6853c/
9. Albertus Resnick IM. On the Causes of the Properties of the Elements: Albert the Great [Internet]. Milwaukee: Marquette University Press; 2010 [cited 2022 Mar 29]. Available from: https://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=688676
10. Temkin O, editor. Soranus' Gynecology. Baltimore: Johns Hopkins University; 1991.
11. Tucker HA. Birth Defects before Epigenesis. Clin Genet. 2008 Oct;74(4):338–42.
12. Doniger W, Spinner G. Misconceptions: Female Imaginations and Male Fantasies in Parental Imprinting. Daedalus. 1998;127(1):97–129.
13. Paré A. On Monsters and Marvels [Internet]. Chicago: University of Chicago Press; 1982 [cited 2022 Mar 29]. 256 p. Available from: https://press.uchicago.edu/ucp/books/book/chicago/O/bo37629686.html
14. Hirai H. Imagination, Maternal Desire and Embryology in Thomas Fienus. In: Manning G, Klestinec C, editors. Professors, Physicians and Practices in the History of Medicine: Essays in Honor of Nancy Siraisi [Internet]. Cham: Springer International Publishing; 2017 [cited 2022 Mar 29]. pp. 239–53. Available from: https://doi.org/10.1007/978-3-319-56514-9_11
15. Pagel W. Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance [Internet]. Basel: Karger Medical and Scientific Publishers; 1982 [cited 2022 Apr 4]. Available from: www.karger.com/Book/Home/220262
16. Huet MH. Monstrous Imagination. Cambridge: Harvard University Press; 1993. 334 p.
17. Smith JEH, editor. The Problem of Animal Generation in Early Modern Philosophy [Internet]. Cambridge: Cambridge University Press; 2006 [cited 2022 Apr 4]. (Cambridge Studies in Philosophy and Biology). Available from: www.cambridge.org/core/books/problem-of-animal-generation-in-early-modern-philosophy/36676015DD931A09A6843FF972240E0D
18. De Renzi S. Resemblance, Paternity and Imagination in Early Modern Courts. In: Mueller-Wille S, Rheinberger HJ, editors. Heredity Produced: At the Crossroads of Biology, Politics, and Culture, 1500–1870 [Internet]. Cambridge, MA, USA: The MIT Press; 2007 [cited 2022 Apr 4]. pp. 61–83. Available from: http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=11164
19. Sharp J. The Midwives Book, or, The Whole Art of Midwifery Discovered: Directing Childbearing Women how to Behave Themselves in Their Conception, Breeding, Bearing, and Nursing of Children in Six Books. London: Simon Miller; 1671. 370 p.
20. Shildrick M. Embodying the Monster: Encounters with the Vulnerable Self [Internet]. Thousand Oaks: SAGE Publications; 2001 [cited 2022 Mar 29]. Available from: www.123library.org/book_details/?id=646
21. The Holy Bible. New international version. [Internet]. Hodder and Stoughton; 1979. Available from: https://search.ebscohost.com/login.aspx?direct=true&AuthType=sso&db=cat00097a&AN=deakin.b1069813&authtype=sso&custid=deakin&site=eds-live&scope=site
22. Kueny K. Marking the Body: Resemblance and Medieval Muslim Constructions of Paternity. J Fem Stud Relig. 2014;30(1):65–84.

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23. Midrash Rabbah. Numbers IX. Stricker; 1669.

24. Preuss J. Biblical and Talmudic Medicine. J. Aronson. 1993; Lanham, MD.

25. Farber Z. Maternal Impressions: From Sheep to Humans – TheTorah.com [Internet]. TheTorah.com. 2013 [cited 2022 Mar 31]. Available from: www.thetorah.com/article/maternal-impressions-from-sheep-to-humans

26. Barilan YM. Jewish Bioethics: Rabbinic Law and Theology in their Social and Historical Contexts. Cambridge, UK: Cambridge University Press; 2014. 297 p.

27. Bos G. The Medical Works of Moses Maimonides: New English Translations Based on the Critical Editions of the Arabic Manuscripts [Internet]. Boston, MA: Brill; 2021 [cited 2022 Mar 31]. Available from: http://ebookcentral.proquest.com/lib/deakin/detail.action?docID=6811470

28. Kruk R. Pregnancy and Its Social Consequences in Mediaeval and Traditional Arab Society. Quad Studi Arabi. 1987;5(6):418–30.

29. Amster EJ. Harem Medicine and the Sleeping Child: Law, Traditional Pharmacology, and the Gender of Medical Authority. In: Ellen J. Amster, editor Medicine and the Saints: Science, Islam, and the Colonial Encounter in Morocco, 1877–1956 [Internet]. Austin: University of Texas Press; 2021. pp. 142–73. Available from: https://doi.org/10.7560/745445-008

30. Furth C. A Flourishing Yin: Gender in China's Medical History: 960–1665. Berkeley: University of California Press; 1999. 374 p.

31. Garbh Sanskar. Baby by Choice, Not by Chance [Internet]. *Hindustan Times*. 2019 [cited 2020 Apr 1]. Available from: www.hindustantimes.com/cities/garbh-sanskar-baby-by-choice-not-by-chance/story-ZnBSjsaBHAerOTh15kOBUI.html

32. Sleeboom-Faulkner M. Eugenic Birth and Fetal Education: The friction between lineage enhancement and premarital testing among rural households in mainland China. China J. 2010;(64):121–41.

33. Smith John D. The Mahabharata [Internet]. Varanasi, UP, India: Penguin; 2009 [cited 2022 Mar 18]. (Penguin Classics). Available from: www.booktopia.com.au/the-mahabharata-john-d-smith/book/9780140446814.html

34. Wujastyk D. The Roots of Ayurveda. London: Penguin Publishing Group; 2003. 454 p.

35. Samhita Caraka. *Caraka Samhita*. Translated by PV Sharma. 4th ed. Varanasi: Chaukhambha Orientalia, India; 1998.

36. Flaws B. A Handbook of Traditional Chinese Gynecology. Boulder, CO: Blue Poppy Enterprises, Inc.; 1987. 260 p.

37. Richardson N. The Nation in Utero: Translating the Science of Fetal Education in Republican China. Front Hist China. 2012 Mar 1;7(1):4–31.

38. Yoshino A. How Was It in Mummy's Tummy?": Japanese Pregnancy Literature. Womens Stud Int Forum. 2008 Nov;31(6):483–91.

39. Kamata H. Japanese Childbirth and Childcare [Nihonjin no Koumi Kosodate]. Tokyo: Keiso Shoboh; 1990.

40. Tanimura R, Chart D. The Record of Women's Great Treasures: Pregnancy and Childbirth in the Edo Period: A Translation of Volume Three of Onna chōhōki. Asiat Stud – Études Asiat. 2017 May 1;71(2):545–66.

41. Fischer-Homberger E. On the Medical History of the Doctrine of Imagination. Psychol Med. 1979 Nov;9(4):619–28.

42. Berg M. Writing the History of the Global. Oxford: Oxford University; 2013.

43. Subrahmanyam S. Connected Histories: Notes towards a Reconfiguration of Early Modern Eurasia. Modern Asian Studies. 1997 Jul;31(3):735–62.

44. Raj K. Beyond Postcolonialism . . . and Postpositivism: Circulation and the Global History of Science. Isis. 2013 Jun 1;104(2):337–47.

45. Epstein J. The Pregnant Imagination, Fetal Rights, and Women's Bodies: A Historical Inquiry. Yale J Law Humanit. 2013 May 8;7(1):139–62.

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46. Arni C. The Prenatal: Contingencies of Procreation and Transmission in the Nineteenth Century. In: Brandt C, Müller-Wille S, editors. Heredity Explored: Between Public Domain and Experimental Science 1850–1930 [Internet]. Cambridge MA: MIT Press; 2016 [cited 2022 Apr 4]. pp. 285–309. Available from: http://edoc.unibas.ch/43812/

47. Dubow S. Ourselves Unborn: A History of the Fetus in Modern America. 1st edition. Oxford; New York: Oxford University Press; 2010. 320 p.

48. Buklijas T. Histories and Meanings of Epigenetics. In: Meloni M, Cromby J, Fitzgerald D, Lloyd S, editors. The Palgrave Handbook of Biology and Society [Internet]. London: Palgrave Macmillan UK; 2018 [cited 2020 Jul 13]. pp. 167–87. Available from: https://doi.org/10.1057/978-1-137-52879-7_8

49. Löwy I. Imperfect Pregnancies: A History of Birth Defects and Prenatal Diagnosis [Internet]. Baltimore: Johns Hopkins University Press; 2017 [cited 2022 Apr 22]. Available from: https://muse.jhu.edu/book/55867

50. Waggoner MR. The Zero Trimester: Pre-Pregnancy Care and the Politics of Reproductive Risk [Internet]. Oakland: University of California Press; 2017 [cited 2021 Sep 16]. Available from: https://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=1571292&site=eds-live&scope=site

51. Richardson SS. The Maternal Imprint: The Contested Science of Maternal–Fetal Effects. Chicago: University of Chicago Press; 2021. 319 p.

52. Londhe D, Chinchalkar S, Kaushik R, Prakash O. Garbha Samskar: Ayurveda Way of Epigenetic Programming. J Res Ayurvedic Sci. 2018 Jul 9(2):42–49

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