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## **Making an “embryological vision of the world”:**

### **Law, maternity and the Kyoto Collection**

Maria Fannin

Lynn Morgan’s 2009 account of American embryo collecting, *Icons of Life*, describes the creation of embryo collections in the U.S. and Europe over the course of the late nineteenth and early twentieth centuries. Embryos were obtained by doctors, most often from women who had miscarried a pregnancy or whose pregnancies were discovered after hysterectomy. Preserved in formalin or other chemical solutions and prepared for examination, the specimens provided teaching and research resources to study embryo morphology and development over time.<sup>1</sup> These collections, Morgan argues, were essential to the establishment of embryology as a science. Embryo collections informed the medical study of pregnancy but also helped shape the development of other sciences, from evolutionary biology to genetics. Collections of embryonic material could be seen as continuous with the practices of anatomists from an earlier age who sought to collect and preserve specimens of humans and animals—and their body parts—for display and study. Embryo collections also sit at the cusp of the genetic and molecular sciences that would soon begin to dominate the study of human development. As Morgan writes, embryological collections inaugurated what would become the central role played by biology—surpassing chemistry—in late twentieth century science. The embryological collections of the nineteenth and twentieth centuries sought to probe the “genesis” of life and its variability and could be said to anticipate the molecular and genetic sciences to come.

This chapter focuses on the social and spatial history of the Kyoto Collection, a collection of embryonic material established in 1961 by Dr Hideo Nishimura at Kyoto University in Kyoto, Japan. In doing so, I extend Morgan's influential social history of the making of embryo collections by scientists in the U.S. and Europe to their counterparts in Japan. Like other embryo collections, the Kyoto Collection, as it is now known, was part of twentieth century efforts to systematically study human development from conception to birth. It also aimed to illustrate variation across embryos deemed to be normal as well as the presence of developmental "anomalies". Much of the material in the collection originated from elective termination of pregnancies, made possible by the legalisation of abortion in Japan under the 1948 Eugenics Protection Law. The collection now houses over 44,000 human embryos and foetuses and is considered the largest human embryo collection in the world. Japan's post-war history of pro-natalist family policy, innovations in the medical surveillance of pregnancy and abortion practice helped shape the development and reception of the collection.

Geographical accounts of archival and museum collections emphasise how relations between collectors and objects, and the collections themselves, reveal the spatial and historical preoccupations of curators and collectors (Hill 2006). At its inception, the Kyoto Collection differed from previous embryo collections. Whereas Morgan describes the collection of embryos in American embryological collections as somewhat ad-hoc and opportunistic, drawing on the goodwill of specific doctors through a relatively small network to build up a collection, Nishimura was able to enrol a large number of doctors who would regularly send materials to Kyoto accompanied by demographic and behavioural data about the women from whom the

material had originated, and they carried out these tasks over a considerable period of time. The acquisition of material for the Kyoto Collection continued well into the latter half of the twentieth century. At a time when most other embryological collections in Europe and the U.S. had long ceased actively collecting specimens, Nishimura continued.

The number of embryos collected by Nishimura thus greatly exceeded those of other embryo collectors. The embryos in the Kyoto Collection were brought together in what one researcher described as a “random manner” by numerous doctors from around Japan. Physicians sending specimens were not asked to select specimens based on specific criteria (for example, whether the foetus was alive or dead when removed from the pregnant woman’s body or whether it was visibly normal or abnormal). Because of this, the Kyoto Collection is considered by researchers to be “representative of the total intrauterine population in Japan” (Nagai et al. 2016, 112). This argument is based on the view that embryos collected primarily from miscarriage were more likely to be abnormal (and thus unviable); those collected primarily through elective termination, like the embryos in the Kyoto Collection, would represent an “unbiased intrauterine population”, a quality that renders the collection valuable for population-based study (Kameda et al. 2012, 48). Together, the collection of biological materials and behavioural data was informed by a kind of “epidemiological reason” (Reubi 2018) that shaped how collectors and curators of the study envisioned their work as leading to a better understanding of the health and development of the Japanese population.

The study of population through the application of epidemiological reason is often told in histories of medical geography through the iconic figures of John Snow or William Budd, rather than through the efforts of anatomists and tissue collectors. Yet the collectors and curators of preserved human tissue aimed to glean the truth of the body's health through the mapping, classification, comparison and analysis of the body's interior. These practices often drew analogies between territory and body and sought to understand how the body was related to and influenced by its environment, including the intrauterine environment. In this way, anatomical study of the body was also a kind of cartographic practice, generating a spatial conception of the body and its relation to other forces within, outside and across the body's supposed boundaries of interior and exterior. In linking the collection of embryos to the broader social practices surrounding the body and the political and legal spaces of abortion, studies of human tissue collections also demonstrate how parts of bodies were made into scientific objects. As Morgan (2004, 4) writes,

Transforming women's calamities into embryo specimens was a cultural achievement that was possible only because most people attached little (if any) moral importance to dead human embryos. In the early 1900s, non-viable human embryos were valued only by embryologists, which made it relatively easy to render them anonymous and a-social.

The creation of embryo collections can reveal the changing moral value of bodies and body parts. They can also reveal changing geographies of reproduction as the end of a pregnancy, whether intended or not, moves into the space of the clinic and is "medicalised". Medical and anatomical collections and their contemporary counterparts, tissue and cell biobanks, are thus important resources for understanding

the history and geography of medicine, and for exploring the bodily geographies of contemporary science and technology.

Morgan's history of embryo collections reveals how these collections became potent visual resources in struggles over reproductive politics in the United States. Inspired by Morgan's work, this chapter asks why and how the Kyoto Collection began actively collecting specimens—and continued to collect them—long after many other embryological collections in the U.S. and Europe had ceased collecting embryos. What social, economic and regulatory conditions made embryo collecting possible in Japan? And how is this collection of preserved embryos regarded today? Embryo collections, and collections of human biological materials in general, are critical, I argue, to understanding the reproductive geographies of contemporary science.

### **Creating the Kyoto Collection**

Hideo Nishimura's early research focused on the anatomy of bullfrogs and was influenced by the work of Friedrich Kraus, an Austrian internist whose book *General and Special Pathology of the Individual* (1926) provided inspiration for engaging in "studies of development as the basis of human life" (Tanimura 1996, 3). Accounts of Nishimura's career during the 1940s emphasise how the war made accessing scientific journals published abroad extremely difficult; after the war Nishimura's work shifted to experimental embryology, where he began to focus his attention on the "intrauterine environment". His interest at the time was on the effects of exposure to chemicals such as nicotine, caffeine and aminoazobenzene derivatives (then used in the treatment of bacterial infections and as a bright yellow dye) on the development of mammalian embryos and fetuses. By 1960, his research assistant Takashi Tanimura

recounts that his work had become increasingly concerned with developmental processes in the human embryo and foetus, influenced by the emerging research from the U.S. and Europe on embryo development.

Nishimura was also, Tanimura suggests, influenced by reports of the effects of thalidomide on developing embryos. Thalidomide was sold in Japan until 1962, nearly a year after the drug had been removed from the market in some other countries (Lenz 1988). The global thalidomide disaster, in which pregnant women were prescribed medication to treat nausea that was later found to cause serious problems in the developing foetus, including missing or malformed limbs, was identified as a turning point in Nishimura's interest in developmental processes. Nishimura's professional activities at this time also included a key role in the establishment of the Japanese Teratology Society, where teratology is defined as the study of abnormal development. In 1961, Nishimura visited the U.S. where he intensified his interest in the development of the human embryo that would shape the rest of his career. In that same year, he began collecting embryos and fetuses from the termination of pregnancies carried out by doctors around Japan.

Collecting embryos was made possible in part through the coordination of the Japanese Medical Association, which sent invitations to physicians licensed to perform abortions to request their participation. In Nishimura's obituary in 1996, it was noted that his "work was assisted by... more than 200 Japanese medical practitioners" (Nishimura 1996, 1137). But in fact the number of practitioners who contributed to his collection was much larger. Around 1400 doctors registered initial interest in participating in the development of the collection, and of these over 970

doctors described as highly skilled in obtaining quality specimens sent materials to Nishimura to be retained for future study (Nishimura et al. 1968; Kameda et al. 2012, 49). Nishimura and his team described these physicians as “willing to provide us with better specimens; an arrangement that allowed us to obtain standardized data on normal and abnormal human development during the stages of organogenesis, based on specimens derived from healthy pregnancies” (Nishimura et al. 1968, 281).

Most of the embryos in the collection were from pregnancies terminated in the first trimester. Once the materials were brought to Nishimura’s laboratory, they were measured, assessed for developmental “stage” according to a classification schema developed from the Carnegie Collection of embryos (known as the Carnegie Stages), and examined for anomalies. Biographical information about the mother was also sent to Nishimura, including the mother’s age, marital status, number of pregnancies, whether she was employed or unemployed, smoked or used alcohol or other drugs including medications, whether the pregnancy ended through “spontaneous or artificial abortion”, the mode of delivery and any symptoms of infection or radiation exposure experienced during pregnancy (Kameda et al. 2012, 51). Embryos were sent from 21 prefectures across six districts of the country, and more than 95% of the embryos in the Collection were sent between 1960 and 1979.

The high number of specimens collected was a result of the coordination of physicians and the bodily contributions of pregnant women on a scale much more extensive than that available to other embryo collectors. Nishimura’s work was effective in amassing the largest embryological collection in the world in part because of the coordination of a number of Japanese clinicians and the institutional support of



both the Japanese Medical Association as well as domestic and overseas funders, including the U.S. National Institute of Health (Tanimura 1996, 3). Nishimura's ability to call on the medical networks of his contemporaries in clinical practice is evidenced by the scale and coordination of collection.<sup>2</sup> However, the scientific success of collecting was not solely the work of a charismatic individual or a set of dedicated clinicians, but was also shaped by the broader social context of Japanese women's access to abortion during the height of the collection's acquisition of materials.

### **Eugenic theories in Japan**

Eugenic theories circulating in Japan in the latter part of the nineteenth and early part of the twentieth centuries targeted women's bodies as "a strategic site in which constitutional improvement of the Japanese 'race' could be made" (Otsubo 2005, 61). Historically high literacy rates enabled mass media dissemination of eugenic theories and popularised concerns over hygiene, nutrition and "eugenic marriage" as central to race betterment (Robertson 2010). Michiko Suzuki (2013, 42) stresses how attitudes towards population *quality* shifted during the 1930s due to the impact of Japan's entry into war with China in 1937, writing that "eugenic principles to improve 'quality' more or less took a back seat to the need for 'quantity' –that is, population growth". During the 1940s, Suzuki argues, policies and laws, including the 1940 National Eugenics Law (modelled after the 1933 Nazi sterilisation law, itself informed by U.S. laws on sterilisation, see Ogino 1996; Robertson 2010), prohibited sterilisation and abortion for the healthy population. Sterilisation was permitted only for those known to have hereditary diseases.

In the post-war period, however, theories of racial improvement began to move away from articulating the need to increase the population and towards re-emphasising its “quality”. These theories were successfully translated into laws in the aftermath of the war that made abortion comparatively accessible. In 1948, the passage of the Eugenic Protection Law made abortion legal under specific circumstances, with commentators attributing this change as a response to the severe food crisis and economic insecurity experienced in Japan at the time (Nishimura et al. 1968, 281). The efforts to rebuild the Japanese economy by limiting population growth, and thus enable the industrialisation and urbanisation of the Japanese workforce, were cited by key legislative proponents of the 1948 law as reasons to expand rather than contract access to abortion. This law made it possible for women to obtain abortion if the pregnancy was the result of rape, if she, her spouse, or a relative had a hereditary physical illness, if she or her spouse had a hereditary *or* non-hereditary mental illness, if either had leprosy or if the pregnancy was likely to endanger her physical health. Earlier efforts to pass a bill giving access to contraception as well as to abortion and sterilisation by reason of “financial hardship” had failed. The successful 1948 Eugenic Protection Law removed the emphasis on birth control and economic criteria. It also authorised only designated doctors to perform abortions and any request for an abortion had to be approved by a “Eugenic Protection Committee”.

In 1949, the law was further revised to include a provision permitting abortion for economic reasons. However, women’s claims to economic hardship were rarely scrutinised. Miho Ogino (1996, 133) writes,

The 1948 law declared that induced abortion was legitimate not only for eugenic reasons, rape, or leprosy of the pregnant woman or her spouse, but also “when the continuation of pregnancy or childbirth would be physically detrimental to the health of the mother.” In 1949, the phrase “or economically” was added to further extend legitimate reasons for abortion. Since there were no guidelines regarding economic criteria, Japanese women were thus practically given abortion on request.

The termination of a pregnancy for “socio-economic” reasons required the request of the woman and the permission of her spouse or partner, an arrangement that has been described as relatively liberal for its time compared with the restrictions surrounding abortion in most Western countries.

This liberalisation of abortion access, despite restrictions around contraception, was not the result of active campaigning on the part of women’s groups—as is reflected in the debates over abortion in Europe and the United States in the 1960s and 1970s—but rather the effect of the ability of Japanese associations of ob-gyns and their leadership in the Japanese parliament to ensure that abortions were provided by doctors, rather than by midwives, other medical professionals or unregulated providers (see Homei 2012). As Samuel Coleman (1992, 18) writes, “abortion became the preserve of a well-organised group of medical specialists who have made it widely available to Japanese married women on a fee-for-service basis”. The law required that all abortion providers must be members of prefectural medical associations. These prefectural associations were where collectors solicited materials for the embryo collection. For Nishimura and his colleagues, the legality of abortion

in Japan meant fewer obstacles to systematic collection, and indeed the request to collect specimens was carried out at the same prefectural level as the training and regulation of doctors authorised to provide abortions. The coordination of collection was thus facilitated by the structure of the legal regulations around abortion that protected the “market” of ob-gyns for abortion provision.

The Eugenic Protection Law reflected the shifting emphasis within eugenic policy in Japan from promoting population growth in order to support Japan’s imperial ambitions, to post-war efforts to “improve” the population and support modern ideals of “protection of maternal health and life” (Norgren 2001, 41). What the Eugenic Protection Law also made possible was a new kind of “tissue economy” that enabled doctors and researchers to systematically collect embryonic material from healthy women’s pregnancies (Waldby and Mitchell 2006).<sup>3</sup> In the U.S. and Europe, many of the specimens sent to embryo collectors in the early twentieth century were obtained from pregnancy terminations carried out either unwittingly, for example upon discover of a pregnancy after hysterectomy (a common treatment in the 1930s for conditions such as uterine fibroids), or under “exceptional” conditions (Morgan 2009). By contrast, abortion was widely accepted as a method of birth control in post-war Japan. Unlike in the U.S. and much of Europe, social and political opposition to abortion in Japan was a relatively minor issue in the post-war period until the 1970s. The systematicity of the Kyoto Collection’s efforts to procure embryonic and foetal specimens illustrates this social and political reality.

The scale and scope of the Kyoto Collection was shaped by the conditions under which abortion was permitted under Japanese law. It also involved the coordination of

hundreds of physicians, and the investments of many hours of time and expertise to prepare embryos for further study. The Collection thus reflects how tissue economies are shaped by the particularities of laws governing life and death, by techniques and practices and by the social and moral significance attached—or not—to embryos. The collection also sheds light on how eugenic policies shaped scientific practice, although not in ways that are self-evident or easily disentangled from other policies aimed at the health of the population. The study of embryological development was not explicitly motivated by eugenic concerns for racial purity or the cultivation of superior populations, but the nineteenth and early twentieth century nascence of embryology shared with more self-consciously eugenic policies the language of “abnormality” and the underlying presumption that human development involved elements of “racial” specificity that required comparative study between populations.

The Kyoto Collection would later be credited with having “greatly contributed to the standardization of the embryonic development of the Japanese, to the study of embryogenesis, and to the analysis of the etiology of congenital malformations” (Fujimoto 2001, 67). The collection is a testament to the coordinated efforts of scientists to create research tools and resources to enable comparison between populations. In this sense, the Kyoto Collection was enrolled in the broader process of *making populations*, linking the collection of biological materials to the study of a population’s “birth, death and space” or territory (Bashford 2007, 173). The study and management of population was a central concern of modern states over the course of the nineteenth century. Governing a modern nation-state “encompassed not only an interest in improving and revitalizing populations...but also the obvious, if sinister, corollary that some populations would be unfit to do so” (Levine and Bashford 2010,

7). Eugenic science was devoted to the “problem” of how best to manage both the quantity and the quality of a population. Embryologists, with their interest in the trajectories of normal and abnormal development, were critical to this enterprise alongside many others.

### **Making biological value: The Kyoto Collection today**

Today, the Kyoto Collection is viewed as a historically significant embryological collection alongside other European and American collections. In an era of big data analysis, the Kyoto Collection’s value for researchers is measured by its ability to “stand in” for a population. By contrast, earlier collections such as the Carnegie and Blechschmidt collections include specimens representing specific abnormalities or conversely ideal-types of embryological development; the Carnegie collection was used extensively to develop a model for assessing the developmental age or “stage” of normal embryonic development (now known as the “Carnegie stages”). The sheer volume of embryos in the Kyoto Collection enables researchers to argue for its ongoing value as representative of something altogether different: its scale and the conditions under which embryos were acquired from healthy women means that it is deemed to provide an accurate representation of the “normal” population.

Reporting on a project to generate a digital research database from the analogue collection of papers and punch cards that contain relevant biographical and medical information about the mothers who contributed to the collection, Tomomi Kameda and co-authors (2012) argue that the Kyoto Collection is viewed as amenable to contemporary epidemiological and statistical analysis. The digitisation project has generated a database of over 22,000 embryos and associated data. Researchers involved in the digitisation project suggest that such a large database representing a

“random” sample of the population will contribute to the development of a better understanding of the causes of embryonic and foetal anomalies, and so inform the diagnosis of embryonic anomalies and the monitoring of pregnancies during the embryonic period rather than the later foetal stage. The collection now has a digital presence through the Kyoto Human Embryo Visualisation Project (Congenital Anomaly Research Center 2010, see also Hill et al. 2016) and is the subject of studies to develop 3D and 4D reconstructions of embryo development (Yamada et al. 2006). These visualisation techniques are employed to probe the developmental processes of organs in the embryo’s interior in an attempt to identify the causes of miscarriage involving embryos that otherwise appear normal (Kanahashi et al. 2016).

Contemporary ethical concerns about access to bodily materials, and specifically embryonic material, also shape the value of the Kyoto Collection today. Compared to the decades spent acquiring biological materials in the Kyoto Collection, “the task of constructing a new collection of human embryos would be both technically and ethically challenging” (Kameda et al. 2012, 53). It would be very difficult to reproduce the collection at a similar scale given current concerns about the ethical use of biological materials and tissues derived from them such as stem cells. The value of the Kyoto Collection is also envisioned through the application of new analytical techniques to the specimens in the collection. Efforts to extract DNA from the wet tissues preserved in formalin and other chemicals are being carried out with the hope, as yet unrealised, that these tissues will “result in a fuller understanding of human congenital anomalies” (Nagai et al. 2016). Genetic research on historical embryo collections poses new ethical challenges, given that the techniques for extracting and

analysing DNA were unknown when the materials were being actively collected and donor consent is often impossible to obtain (Asai et al 2002).

Morgan situates the social history of embryo collections as a means of tracing the changing moral status of the embryo and foetus over time, writing: “[w]hereas a hundred years ago embryologists were the only ones to care much about the disposition of dead embryos, today they are increasingly viewed as active, animated agents” (Morgan 2004, 3). Embryo collecting today has shifted spatially from the gynaecological clinic to the contemporary spaces of assisted reproduction, where “surplus” embryos are transformed into research resources (see Parry 2006, Waldby and Mitchell 2006, Thompson 2007, see also Collard in this volume). While embryos and foetal materials are still collected from pregnancy termination, the emergence of reproductive technologies that produce excess embryos have transformed the social and moral geographies of embryo and fetal tissue collecting. However, contemporary discussions of embryo donation from IVF treatments highlight the persistence of the invisibility of women’s bodily contributions in medical and scientific literatures on donation. As Masae Kato (2014, 252) writes in her account of ongoing research with embryo donors in Japan and their changing conceptions of the “gift” of donation,

[m]any medical specialists speak as if embryos are just there, like fruits growing on trees (Dickenson, 2007, 60; Tsuge 2002)...more than 90% of interviewed IVF specialists stated that technological advancement has rendered ova collection painless, and IVF has become so generally accepted that “women do not have special feelings about IVF experience, unlike abortion” (Kato and Sleeboom-Faulkner, [2011], 435).<sup>4</sup>



Accounts of the acquisition of materials for the Kyoto Collection maintain that women did provide informed consent for their bodily materials to become part of the collection (Kameda et al. 2012). It is possible that informed consent in this historical context was granted verbally, as it is often today in Japan. There is however no clear evidence of precisely what women understood about their participation in the development of the embryo collection.

The Kyoto Collection bears witness to the efforts of researchers to create an archive of “normal” as well as “pathological” human embryonic development. But embryo collections reveal more than the history of scientific achievement, the ambition and determination of their original curators as well as the contribution of many donors. Morgan contends that embryo collections were instrumental in shaping what she calls an “embryological vision of the world”, a modern vision of human pregnancy as a series of developmental stages, revealed by technological means. She argues that embryology has been so influential, and the embryological vision produced so taken for granted, that images of the embryo and foetus are frequently used to stand in for “life” itself. Embryo collections, Morgan argues, enabled the classification of pregnancy from the “point of view” of the developing embryo and foetus, and their legacy today is in part revealed by the affective power of images of the foetus in public culture.<sup>5</sup> This embryological vision of the world is critiqued by feminist scholars in the U.S. and Europe for its promotion of the foetus as “free-floating” and independent of the mother’s body (Petchetsky 1987, Roberts 2012).

Although the collection of embryos to illustrate human development no longer takes place at the scale described by Morgan and made manifest in the Kyoto Collection,

embryos and the stem cells derived from them continue to be viewed as controversial biological materials engendering public debate and regulatory oversight. Morgan cites the iconic status of the foetus as a figure of “life,” beginning with the presentation of foetal imagery in the documentary photography of Lennart Nilsson (1965) that featured on the cover of *LIFE* magazine in 1965. Pro-life campaigns use images of embryos and foetuses to argue for the restriction or prohibition of abortion; foetal and embryonic imagery features heavily in medical representations of pregnancy as well as pregnancy advice literature; and “fetishized fetal imagery” is used to market an array of products to consumers (Paxson 2004, 246, see also Petchetsky 1987, Haraway 1997, Morgan and Michaels 1999, Taylor 2008). The ubiquity of foetal imagery in American popular culture and in the debates surrounding women’s access to abortion suggests that the remaining collections need to be maintained. These collections offer historical insight into the development of a science and the knowledge practises that relied so significantly on the contributions, even unwitting, from the pregnancies of thousands of women.

Embryo collections also played an important role in grounding theories of human development, and in materially underpinning the study of groups of people as “populations”. The ethical and relational dimensions of collecting bodily materials are the subject of extensive work in sociological and anthropological literatures. However, the spatial dimensions of the establishment of tissue collections as exemplars of “populations”, defined in ethno-racial terms, or as representatives of human population diversity, have only recently begun to receive attention from geographers (see Nash 2015). Despite their role in shaping medical and scientific knowledge, embryological, anatomical and other collections of human biological

materials have been of relatively little interest to cultural or medical geographers to date, with a few notable exceptions (Hill 2006, Hussey 2017, Morton 2017). Indeed, there is far more detailed research in historical and cultural geography on natural history collections focusing on the lives of animals and plants, and the specimens they became, than on medical and scientific exploration of the human body's interior. Yet these interior bodily spaces, and the efforts to make them visible in anatomical collections, are critical to scientific as well as popular understandings of the relationship between life and death, the individual and the population, and in the embryo collection, the pregnant body and the foetus.

Studies of the creation of human anatomical collections, including embryo collections, can reveal how environmental and behavioural dimensions of human existence, and the relations between them, were theorised and put into scientific practice. More importantly, anatomical collections and particularly collections that seek to archive human development through materials derived from pregnancy suggest that the collection, classification and analysis of biological materials from the body's interior were also central spatial concerns of modern biopolitics. Indeed, the study of life in the medical and life sciences was never confined to that of the living organism but also to the fixing or arresting of life, preserving and retaining dead specimens for future study in the spaces of scientific collections, laboratories and biobanks (Radin 2013, Fannin and Kent 2015). Tissue collections were one of the means by which reproductive bodies could reveal their innermost secrets. Connecting the interior of the pregnant body to the study of a national "population", they also helped create norms through which the surveillance of pregnancy could operate.

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1 In the United States, the Carnegie Institution of Washington houses over 8,000 embryonic and fetal specimens collected from 1911 to the 1940s. The U.S. National Museum of Health & Medicine's Human Developmental Anatomy Center also houses several smaller collections. In Europe, the University of Göttingen is home to one of the most striking collections, the Blechschmidt Collection established in 1948, that includes large-scale reproductions in wax of human embryos at various stages of



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development. Other significant embryo collections in Europe include the Hinrichsen (Ruhr-University Bochum), the Madrid Collection (Complutense University of Madrid), the Hamilton-Boyd Collection (Cambridge University), the Hubrecht Collection (Museum für Naturkunde, Berlin) and the Human Developmental Biology Resource (Newcastle University).

2 Nishimura published widely in English-language journals, although a review of his 1964 publication entitled *Chemistry and Prevention of Congenital Anomalies* (Springfield, IL: Charles C. Thomas) lamented that the text was “devoted almost exclusively to American and European work” and offered few insights into the “extensive work which must be presumed to be going on in a country which might well claim supremacy in biological laboratory work, facilities and equipment, and in which abortion is legal.” See J. H. Edwards, *Proceedings of the Royal Society of Medicine*, 1964 November, 57(11): 1118.

3 The history of Japanese laws related to abortion and contraception note the exceptional status of abortion law in the post-war period compared to other places. Access to abortion in the US and Europe during this same period was very difficult to obtain and in the US was particularly limited. By 1967, 49 US states and Washington, DC regarded abortion as a felony and access to information about abortion was severely restricted under the Comstock Act of 1873. The liberalization of abortion in both the US and across much of Europe did not take place until the 1960s and 1970s. The Comstock Act was repealed in 1971, the same year in which abortion in the US was “legalized” although not granted as an absolute right to women. Rather, access to

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abortion in the US under *Roe v. Wade* was granted on the basis of protecting rights of privacy in the doctor-patient relationship.

4 This invisibility of women's embryo donation is complicated in the case of donation originating from the termination of pregnancy, as there is the presumption that women do not want to know about the use of their donated tissues (Kent 2008). Women do express ambivalence about the use of their tissues: some are keen to know that the material they donate will not continue to 'live' and are therefore uncomfortable with use of this material in research. Others by contrast are interested in seeing their material 'live on' as useful in another (research) setting. Kato's study of women's embryo donation during IVF reflects a similar ambivalence on the part of donors as well as changing conceptions of the embryo as women went through the process of IVF. Some wanted to 'protect' their embryos from use by researchers; others expressed their willingness to donate as a way to 'give meaning to the lives of their "children," or embryos, just as some parents might donate organs of their deceased children so that they might contribute to other people's lives' (Kato 2014, 361).

5 The post-war imaginary of the "menacing" foetus that haunts its mother captivated audiences and consumers of new spiritual practices of *mizuko kuyo* in Japan in the 1970s. The cultural and religious dimensions of these practices carried out to appease the spirits of deceased fetuses are explored in works by Helen Hardacre (1997) and William LaFleur (1994).