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The Embryography of Alice B. Toklas

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When Gertrude Stein (1874–1946) was a medical student at Johns Hopkins in Baltimore, she spent the autumn of 1901 constructing an anatomical model of a young human brain. Most accounts call it an "embryo" brain, although as we shall see it likely belonged to a fetus or infant. The assignment was her final opportunity to obtain the medical degree after failing four classes in the spring of her senior year. Her anatomy professor, Franklin Paine Mall (1982–1917), offered her a second chance to graduate if she would finish her brain model and write an accompanying manuscript. Stein eventually produced sixty-three drawings and "roughly twenty-five pages of text," in addition to the model itself (Meyer 2001: 89).[1] She submitted the work in January 1902, but Mall judged it as inept and threw it away. Stein set off for Europe, leaving medicine behind forever. She settled in Paris where she became an avant-garde

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[1] Did she cut the brain sections herself? Meyer thinks it unlikely. He postulates, "the microscopical sections Stein was working with had been prepared at some earlier date, whether by her or, as is more likely, by some third party." Even the illustrious Miss Sabin, he points out, had not cut her own sections (2001: 89). That is true, but the evidence about Stein's specimens is contradictory. Sabin's letter states that Stein had indeed sectioned and mounted her own specimens, and, Stein's notorious sloppiness and the sticky doorknobs had made an unforgettable impression on her lab mates. The historical record also leaves no clear answer to the question of how many brains Stein sectioned and modeled. I suspect that Stein made only one model, for which she used the brain sections she had earlier prepared for Barker. Yet she mentions two brain series, both the "embryological series" as well as "the adult series [i.e., set of serial sections] that I finally made" (Meyer 2001: 99). It is not entirely clear why Stein would have made an adult series, but it is conceivable that Mall might have advised her to do so to compare or corroborate her findings. Mall had once hoped that Stein's work would contribute to a sequential series of embryological-infant brain models, of which Sabin's had been the first. While this hope was still alive, Mall had written urgently to Barker, saying, "Miss Stein is diligent at work with her model. She must have the brain of a child 6 months old in order to connect her work with Miss Sabins! Can you not supply it? I told her that I would write to you asking for material" (quoted in Wineapple 1996: 150). But there is no evidence that Mall's hopes were ever realized. As an alternative, he might have asked Stein to section an adult brain in a different plane, against which to check her model. Or, he might have assigned the additional task to insure she understood the developmental outcome of the midbrain region. The adult brain, as Meyer says, would have "served to check the first" (2001: 99).

writer most notably known for her book supposedly chronicling the life of Alice Babette Toklas (1877–1967), who was Stein's longtime lover, secretary, editor, cook, and companion. The book, published in 1933, narrated the life of the inimitable Gertrude Stein, although it was playfully titled *The Autobiography of Alice B. Toklas*.

Literary scholars have examined the effect of Stein's medical training on her narrative forms and themes as a way to pre-figure her later career and to analyze the relationship between science and artistic modernism (see Chodat 2005; Farland 2004; Henderson 2004; Wineapple 1996). This essay, by contrast, takes advantage of Stein's fame to read back into the historical constitution of embryos as social and scientific artifacts. It centers on the experiences of a medical student who happens to have been Gertrude Stein, but I make no pretense of contributing to Stein criticism or biography, nor do I claim any parallel between Stein's brain model and *The Autobiography of Alice B. Toklas*. Stein appears here because her fame ensured that her student experiences were documented and preserved. Other medical students undoubtedly faced similar challenges, but their papers were not similarly archived. Stein's experience allows us to examine the history of the cultural logics used to make sense of nascent human life (Conklin and Morgan 1996; Morgan 2006). How do people come to understand what embryos and fetuses are and what they mean? How did embryo stories told by early-twentieth-century anatomists shape contemporary cultural ideologies about the beginnings of life? Stein's brain model was constructed at a time when positivist science was quickly coming to dominate middle-class notions of medicine and the body. The embryologists' biologically based accounts of "how we came to be" eventually became hegemonic, displacing other explanations based in religion or women's realms (Duden 1993). The consequences of the embryological view are evident today in debates about frozen embryos and embryonic stem cells that should be traced to these early-twentieth-century embryo-producing efforts. Stein's embryo encounter offers useful lessons about how embryos—as scientific artifacts—came to be materialized, how that materiality was ascribed value, and how knowledge disputes were adjudicated.

This essay was inspired by the work of literary scholar Steven Meyer, whose 2001 book *Irresistible Dictation: Gertrude Stein and the Correlations of Writing and Science* is the most rigorous examination to date of how Stein's scientific work influenced her understanding of the boundaries between subjectivity and objectivity, concreteness and abstraction, and sense and nonsense. Meyer argues that *The Autobiography of Alice B. Toklas* is intriguing precisely because it blurs the traditional boundaries between biographical subject, biographer, and biography (Meyer 1992; 2001). We can appreciate the ontology of the entity we call "embryo" in a similar way, not merely as a biological object or manifestation of natural fact, but as a cultural artifact that embodies the technologies that turn body into story, as Haraway put it (1997: 179),

the processes through which an embryo is materialized, and the stories told about it.

My research began with an ostensibly simple question about the age of Stein's specimen. Had she worked with an *embryo* specimen from the first eight weeks of development, as some accounts said, or with an older fetus or infant? The question proved impossible to answer. Neither Stein's model nor the accompanying manuscript have survived, and descriptions of the specimen in the correspondence were maddeningly contradictory. Each of Stein's professors and classmates, all trained embryologists and presumably capable of using technical terminology correctly, referred to the specimen differently. One called it an "embryo," another a "seven-month fetus," another a "new-born babe," and one a "six-month-old child." My inability to specify the nature of Stein's specimen resulted in a "defamiliarizing moment" (Knauft 2006: 408), when I realized that my quest was based on a theoretical assumption about the existence of an objective empirical truth that I otherwise disavowed.[2] Cultural trappings are just that, and my efforts to clarify the confusion reflected my assumption that anatomical referents, including embryos, "should" (in cultural terms) map neatly onto anatomical objects. For at least the last fifty years, Americans have been taught to expect that embryologists' models and visual depictions are realistic accounts of developing human beings, a window to the womb (Duden 1999; Michaels 1999). With that realization, my quest for empirical certainty began to seem less interesting as mission than as metaphor.

This paper uses Stein to explore how embryos are configured as natural and cultural artifacts. It aims to provoke in readers a similarly defamiliarizing moment by arguing that the embryos we "know" are not principally natural entities, nor is knowledge about them simply revealed through progressive empirical investigation (see Maienschein 2003). Embryos as most Americans know them today are products of an era of scientific rationalism. They were produced in the very laboratories where Stein worked. Embryologists constructed the conceptual boundaries that separated (and continue to separate) three domains: (1) embryographical subjects (the embryos we see and imagine); (2) the embryographers (more commonly called "embryologists") who produce descriptions, images, and culturally authorized accounts of embryos; and (3) embryographies, that is, the stories we tell ourselves about what kinds of entities embryos are, what they mean, and how to value them. These conceptual boundaries remain largely intact today, in part because embryo discourses tend to reinforce what Meyer calls the "stable equilibrium of subjectivity and objectivity" (Meyer 1992), that is, the supposed dichotomy that separates empirical embryos found in the laboratory from the fanciful or

[2] Thanks to Meredith Michaels for posing the question that helped me reach this conclusion. "How would your analysis change," she asked, "if you suddenly discovered Stein's long-lost model?"

overtly politicized representations of them found in popular culture. To appropriate Meyer's analysis for a critique of embryo ontologies, we might say that a similar dichotomy produced embryos while it made the work of producing them—the collecting of specimens, fixing, sectioning, and model making—seem to vanish. The boundaries between embryo as subject, embryologist as author, and embryological origin stories constitute the conceptual architecture of our embryological worldview. Embryos (as subjects) were constructed by embryologists (as authors and artists) who favored empiricism and rejected non-empirical ways of knowing embryos (as their narrative convention).

Interrogating these boundaries can lend insight into "the triumph of the embryological view of life" (Hopwood 2000: 32) and show how cultural interpretations continue to dominate our views of embryo ontologies. Ever since the nineteenth century, embryos have been regarded as entities founded in biology, produced inside bodies (and also, more recently, in fertility clinics and laboratories), and interpreted best by scientists. Embryos still tend to be regarded as natural rather than cultural objects. A reflexive alternative to this view is articulated by developmental biologist Scott Gilbert, who analyzes images of embryos used by anti-abortion activists to illustrate the importance of context in shaping representations of embryos and fetuses (Gilbert 2006). The hegemony of the non-reflexive view complicates our ability to apply cultural critique to embryos, and plenty of philosophers work on the assumption that definitional disputes over embryo and fetal status can be resolved with airtight logic rather than by understanding the constitutive character of the disputes, that is, the cultural and historical contexts within which embryos are ontologically fashioned, ascribed value, and adjudicated (Khushf 2006). The blurring of boundaries proposed in this essay can prove theoretically useful in understanding the discursive constitution of disputes—such as those concerning abortion, stem cells, cloning, and fetal tissue research—that hinge on contested definitions of embryos, pre-embryos, and other epistemologically slippery creatures (see American College of Obstetricians and Gynecologists 2002; Biggers 1990; Maienschein 2002; Mahowald 2003; Mulkay 1997).

This essay is organized into four sections. The first sets the stage at the Johns Hopkins Medical School anatomy laboratories, the headquarters for human embryology in the early twentieth century. The second section examines conflicting accounts of Gertrude Stein's model-building effort to illuminate inconsistencies in the anatomists' accounts, and the third section analyzes the rationale behind Mall's decision to reject Stein's model. The final section considers scientists' reasons for distancing themselves from Stein after the publication of *The Autobiography of Alice B. Toklas*. They used Stein's "nonsensical" prose as an *ex post facto* justification for her medical school failure and congratulated themselves on their ability to recognize the epistemological boundary—between objective science and subjective

fiction—that they were simultaneously enacting. This essay argues that embryos are better understood—like *The Autobiography of Alice B. Toklas*—as collaboratively constituted artifacts, formed by the intersections of object, author, and story.

HUMAN EMBRYOLOGY AT JOHNS HOPKINS

When Stein started medical school in 1897, the Johns Hopkins Medical School had been open for just four years. The anatomy department, under Mall's direction, faced the enormous responsibility to build and equip new laboratories, acquire sufficient cadavers for dissection, and put anatomy onto a dignified professional footing (Sabin 1934a). In addition to his teaching and administrative duties, Mall nourished the passion for human embryology that he had acquired in Germany under the tutelage of anatomist Wilhelm His (1831–1904). His had invented the microtome (used for slicing anatomical sections), developed the science of histogenesis (studying the embryological origins of organs), and perfected techniques for collecting and sectioning human embryos and fetuses. Mall was enthused by His' techniques, which would allow researchers to study the anatomy of tiny human embryo specimens (Hopwood 1999). He had little time to pursue his passion in the late 1890s, but by 1913 he had acquired a personal collection of one thousand human embryo specimens and persuaded the Carnegie Institution of Washington to finance a Department of Embryology. The Carnegie Collection of Embryology became the most renowned collection of human embryological specimens in the world; it is housed today with other embryological collections at the National Museum of Health and Medicine in Washington, D.C.

"In the nineteenth century," notes historian Nick Hopwood, "embryology was a central science of life" (2004: 170; see also Coleman 1971: 36). Mall was convinced that the life sciences would be well served by careful documentation of the earliest stages of human embryological development, then largely unknown. Like the many comparative anatomists he knew—that "host of young Darwinists sectioning their way through the animal kingdom" (Hopwood 2004: 186)—Mall regarded human embryos as a species of "natural" objects. For that reason, he had no moral reservations about collecting and sectioning human embryos. On the contrary, he argued that embryological research could "establish certain points of great value to medicine and to the race" (Mall 1911: 345). Mall was sure that clinical medicine would be served by embryology's insights into "physiology, teratology, and pathology" (1911: 347). Embryology would shed light on the causes of birth defects, miscarriage, molar and tubal pregnancies, the consequences of venereal disease, and other anomalies of pregnancy (1911: 345), some of which might eventually be "eliminated altogether," Mall hinted, as a result of embryological research (1911: 345). These were ambitious goals that could be met only by collecting and analyzing large numbers of human embryo specimens.

From the anthropologist's perspective, the emergence of the embryo presupposed the conversion of unspecified matter into a specimen (see Hopwood 2000: 40). Scientists specified the steps to be taken. Embryos first had to be acquired from clinical colleagues who got them from women who had a spontaneous or induced abortion, a hysterectomy, or who died while pregnant. Once a specimen reached the laboratory, its story was untethered from its biological and social origins. Embryos exist unto themselves, interpretable without reference to pregnant women or other encumbering social circumstances. As Hopwood points out, "'freeing' embryos of their means of connection to the pregnant woman created the persistent illusion that they develop by themselves" (2000: 42). Materializing the specimens required that each be assigned a number, measured, and classified according to the medium in which it was measured (alcohol, formalin, or fresh), the type of stain and counter-stain used, the number and thickness of sections, the direction of section (transverse, saggital, or coronal), and the condition of preservation (excellent, good, fair, or poor). Whenever possible, specimens were then fixed, embedded in paraffin, and sliced into serial sections to be mounted on slides. Later, medical illustrators and modelers would draw pictures and make oversized models depicting anatomical features, and embryologists would write scientific papers describing what they found. These techniques constituted the very embryos that embryologists claimed to study (Clarke 1987; 1998; Hopwood 1999; 2000; 2002; 2006).

Mall accepted virtually every specimen he was offered, although many of the specimens he received were worthless. They were too large to be of interest, macerated by having remained dead too long in the womb, distorted by being preserved in the wrong chemical solutions, or squashed into receptacles that were too small. In 1891 he lamented, "It frequently happens that human embryos which come into my possession are almost ruined by the physician's carelessness in preserving the material" (Mall 1891: 1144; see also Hopwood 2000: 49). Nearly two decades later, he regretted that only about half of the 300 existing sectioned, mounted specimens in the United States were "well preserved" (Mall 1910: 355). Yet Mall had several reasons to hold onto even worthless specimens, because the microtome provided just one measure of the worth of a dead embryo. By accepting even useless specimens, Mall respected the goodwill of the doctor who provided the gift, in hopes that future donations might be fresher or better preserved. Furthermore, even if a specimen were not fit for sectioning, it could serve as part of a series, be dissected by medical students, or be given to a lesser institution and thus initiate a chain of exchange that would enhance Mall's prestige (Anderson 2000). Every additional specimen in Mall's steadily growing collection was a feather in his cap, evidence that he was what anthropologists might call a "big man" who possessed the power to accumulate wealth in the form of embryo specimens. This status was useful as Mall sought foundation funding for an embryological institute (Mall 1911).

GERTRUDE STEIN'S BRAIN MODEL[3]

The popularity of embryology meant that Gertrude Stein had been exposed to the field before she entered Mall's laboratory. She took her first embryology course in college at Radcliffe in the 1890s, followed by an advanced vertebrate embryology course at Woods Hole in the summer of 1897 (Wineapple 1996: 105).[4] After spending the summer collecting marine embryos and surrounded by illustrious embryologists (including Frank R. Lillie and Charles Otis Whitman), Stein moved to Baltimore to study medicine.

Among her first courses in medical school was anatomy with Mall. Brenda Wineapple writes that Stein "delighted in Doctor Mall" that first year at Johns Hopkins. She extolled his dry wit and praised his hands-off teaching style. She "disdained learning by rote, valuing only the 'self-inspired,' as she called it, the creative and original work that [...] was not necessarily rewarded outside Mall's laboratory" (1996: 125). Mall, in turn, appeared to appreciate Stein. In contrast to other Johns Hopkins professors, Mall was known for supporting female students. Mall and Stein were both children of German immigrants, and Stein's independent mind and spirit were well suited to Mall's notoriously vague, laissez-faire teaching style. Mall believed neither in lecturing nor in examinations; he preferred to let students work independently and learn inductively. Mall gave Stein the highest grade she received in medical school (Schoenberg 1988: 251).

When literary scholars and historians describe Stein's anatomical modeling work, they often begin with the account she provided in *The Autobiography of Alice B. Toklas*. "The first two years of medical school were alright," Stein wrote. "They were purely laboratory work and Gertrude Stein under Llewelys [*sic*] Barker immediately betook herself to research work. She began a study of all the brain tracts, the beginning of a comparative study" (1933: 99). Stein's work had been assigned by Lewellys Franklin Barker (1867–1943), Mall's new assistant. Barker, who was described as a determined, good-looking man, had just returned from a research expedition to India, Hong Kong, Japan, and the Philippines. He lost no time recruiting students to do the

[3] Stein's medical career has been reconstructed over the years as new evidence has been discovered, pieced together, and interpreted by Stein biographers and historians including Bensley 1984; Bridgman 1970; Farland 2004; Gallup 1953; Meyer 1992, 2001; Nakajima n.d.; Sander 2002; Schoenberg 1988; Sprigge 1955; Wilson 1971; and Wineapple 1996.

[4] In a coincidence that would interest only someone with an embryo-centric view of the world, Stein's Latin tutor was sixteen-year-old Margaret Adaline Reed (1881–1970), who went on to become an eminent embryologist and a specialist in tissue culture as the collaborator and spouse of Warren Harmon Lewis (see Landecker 2004); the couple worked for many years in Mall's lab (cf. Wineapple 1996: 112). An anonymous reviewer pointed out that further information and photographs about Stein's experience at Woods Hole can be seen at the MBL (Marine Biological Laboratory) website: http://www.mbl.edu/publications/women_stein.html; accessed 1 Aug. 2007.

grunt work for an ambitious neurology treatise he was compiling; the "study of all the brain tracts" to which Stein refers was in fact Barker's project. It required many detailed histological accounts of the central nervous system, in other words, many dissected brains. Accurate models were indispensable to understanding anatomical structures in three dimensions, and a talented model maker was a valued member of any anatomy department (Hopwood 1999).[5] Because Stein was studying brain anatomy and physiology and because modeling was considered "an ideal exercise for a junior researcher" (Hopwood 2002: 59), Stein was a logical choice as a research assistant. Barker assigned her the task of modeling a little-known region of the brain called the nucleus of Darkschewitsch,[6] which required that she section and stain a brain and describe the anatomical structure. Barker appreciated Stein's work and gave it a couple of pages in his mammoth 1899 volume, *The Nervous System and Its Constituent Neurones* (see Meyer 2001: 75–79; Barker 1942: 60–61). This single citation provided the basis for Stein to boast, in *The Autobiography of Alice B. Toklas*, that she had developed a "reputation for original scientific work" (1933: 101).

It is important at this juncture to introduce Florence Rena Sabin (1871–1953), a classmate of Stein's at Johns Hopkins. Sabin was three years older than Stein and a year ahead of her in medical school. They were acquaintances, thrown together with the other female students, yet their medical careers took different paths. Sabin was a talented embryological anatomist "who is credited with discovering that the lymphatic vessels arise from endothelial budding from embryonic veins—a discovery that was confirmed only as late as 1999."[7] While in medical school, Sabin made a highly celebrated brain model and went on to become a pioneering medical scientist, while Stein bungled her brain model and left Johns Hopkins in disgrace. Sabin had an aptitude for anatomical investigation. Playfully dubbed

[5] There were contradictory attitudes regarding the prestige attached to modeling. Despite Stein's lofty assessment of the modeling work, her brother Leo later said his sister had complained that it was no more than busywork, as "the women who were at Johns Hopkins for the first time fell in with Mall's hobby for making models of the brain tracts, to show how interested they were; that the men wouldn't waste their time on it" (in Meyer 2001: 347, fn. 21). Some saw modeling as busywork unfit for serious scientists (see Farland 2004). In an oft-repeated line, Leo said Gertrude reported that a visiting German scientist had once observed that model making was "an excellent occupation for women and Chinamen" (L. Stein 1950: 148; Wineapple 1996: 124).

[6] According to Gray's Anatomy in 1918, "The posterior commissure is a rounded band of white fibers crossing the middle line on the dorsal aspect of the upper end of the cerebral aqueduct. Its fibers acquire their medullary sheaths early, but their connections have not been definitely determined. Most of them have their origin in a nucleus, the nucleus of the posterior commissure (nucleus of Darkschewitsch), which lies in the central gray substance of the upper end of the cerebral aqueduct, in front of the nucleus of the oculomotor nerve. Some are probably derived from the posterior part of the thalamus and from the superior colliculus, while others are believed to be continued downward into the medial longitudinal fasciculus" (http://www.bartleby.com/107/pages/page812.html, accessed 24 July 2003).

[7] I am grateful to an anonymous viewer for this point.

"Flossie" (reportedly because she was "the least flossy of any dame ever created"),[8] she was modest, meticulous, and loyal. In 1900, Sabin's "A Model of the Medulla Oblongata, Pons, and Midbrain of a New-Born Babe," was published to wide acclaim at Johns Hopkins (Meyer 2001: 86). The eminent German anatomical modeler, Friedrich Ziegler, agreed to construct intricate wax models of the brain to accompany the atlas (see Hopwood 2002).[9] He invited Sabin to spend seven weeks in Freiburg, Germany, to supervise his work and answer his questions. Barker wrote to compliment Sabin on the book: "It is really very fine, and [Henry McElderry] Knower [who edited Sabin's text] has been happy in the arrangement. We were all delighted here to learn that Ziegler is to reproduce the model at [Philipp] Stohr's suggestion. I think you will be surprised at the wide distribution it will gain when it is once reproduced" (Barker 1901; see also Hopwood 2002: 61).[10] Sabin returned to Johns Hopkins in the fall of 1901, where her medical career continued to thrive. In October, Mall—normally taciturn and thrifty with his praise—wrote to Barker, "Miss Sabin's work is progressing in a brilliant way." The following year, on the basis of her "reputation for original scientific work," Sabin became the first woman appointed to the Johns Hopkins medical faculty. She was a lifelong friend to Mall's wife, the first woman president of the American Anatomical Association, and the first woman to become a lifetime member of the National Academy of Science. She quickly established herself as Mall's protégé, and the success of her model motivated Mall to assign Stein a similar project.

While Sabin's career was soaring, Stein's grades had begun to slide. In spring 1901, Stein was not permitted to graduate with her class.[11] In *The Autobiography of Alice B. Toklas*, Stein pretends to be unscathed by the failure and to have done nothing to reverse the decision: "The professor who had flunked her asked her to come to see him. She did. He said, of course Miss Stein all you have to do is to take a summer course here and in the fall naturally you will take your degree" (1933: 101–2). She says she told the professor that she was bored with medicine and relieved to be done with it, but does not mention that

[8] As George L. Corner, Director of the Carnegie Institution of Washington Department of Embryology after Mall, reportedly said of her, according to Erik Erikson (personal communication 2002).

[9] See Hopwood (2002) for a description of Sabin's work in Ziegler's laboratory, and for photographs of the resulting models.

[10] Nick Hopwood's 2002 book, *Embryos in Wax*, provides stunning photographs of these models and a riveting description of the modeling process.

[11] Several secondary sources describe this phase of Gertrude Stein's life. The most detailed include Richard Bridgman's 1970 book, *Gertrude Stein in Pieces*; Gene Nakajima's unpublished manuscript, written circa 1987, called "Gertude Stein's Medical Education and her Evolving Feminism"; Brenda Wineapple's 1996 book, *Sister Brother: Gertrude and Leo Stein*; Steven Meyer's 2001 *Irresistible Dictation: Gertrude Stein and the Correlations of Writing and Science*; Kathleen Waters Sander's 2002, "The Unknown Gertrude;" and Bruce S. Schoenberg's 1988 article, "Gertrude Stein's Neuroanatomic Investigations: Roses or Thorns?"

Mall offered her the chance to graduate if she would return to Baltimore in the fall to make a model of a young human brain. Mall explained the agreement to Barker (who had left in June 1900 to take a position at the University of Chicago) in August: "Miss Stein failed to graduate with us last June. She comes up again next Feb. After that I will do all in my power to make her round out her work started with you. She is you know difficult to manage as she has the [weakness] to [bite] off continually more than she can [swallow]" (quoted in Wineapple 1996: 144). By the time that letter was written, Stein had taken off to spend the summer of 1901 in Europe.

Stein returned reluctantly to Baltimore in October, humiliated. The recollections of Dorothy Reed Mendenhall, a classmate of Sabin's, have been a key source of insight into what happened that autumn.

> Dr. Mall gave her [Stein] a problem similar to one Dr. Sabin had completed successfully in her fourth year. This was the serial sectioning of an embryo human brain and its reconstruction, and a study of the development of the centers in the brain and the tracts leading from them. She worked on it for weeks and finally handed her reconstruction with a description of what she had found to Dr. Mall in the hope that it would be credited to her instead of obstetrics and allow her to graduate. Some days after, Dr. Mall—the greatest living anatomist at the time—came to Dr. Sabin and said, "Either I am crazy or Miss Stein is. Will you see what you can make out of her work." Florence worked over it for several nights and came back to Dr. Mall with the answer that Miss Stein must have imbedded the cord turned back under the embryo brain, instead of extended from it, and the centers of out born (?) [typist's question mark appears in the original] cells of the cord she had located in the brain, and other mysterious features of the reconstruction, could be explained only in this way. She asked Dr. Mall what she should do with the model. As usual—he said nothing—but shied the entire model and explanatory text into a waste basket. Miss Stein was refused her degree. Yet in *Alice B. Toklas* she tells briefly of student days in Baltimore and mentions a model of an embryo brain which she had made and which was of much service to the students (Mendenhall 1939–1953: 25).[12]

Mendenhall's account, it should be remembered, was written approximately forty years after the events transpired and well after Stein's reputation had been established.

Correspondence between Sabin and her medical school classmate, Joseph Marshall Flint (1872–1944), provides an additional account—what Sabin confidently calls "the true story"—of Stein's embryo research. Flint had started medical school at Johns Hopkins in 1896, the year before Stein was admitted.[13]

[12] Edmund Wilson, Mendenhall's nephew, reprints this in his 1971 book, *Upstate: Records and Recollections of Northern New York*, noting, correctly, that *The Autobiography of Alice B. Toklas* does not, in fact, mention an embryo brain.

[13] As Barker's assistant, Flint went along on a sobering medical mission to the Philippines, where they saw the ravages of grim diseases not seen in Baltimore, including plague, dengue, beriberi, and leprosy. Toward the end of their trip, Barker and Flint split from the other members of their mission and traveled together through "British India," later co-authoring an article about an outbreak of bubonic plague they witnessed there (1900; see also Anderson 2006). Flint graduated from Johns Hopkins in 1900 and joined Barker at the University of Chicago; Barker took Flint

He left Baltimore in 1901 to direct the new anatomy department at Berkeley, and so did not witness Stein's debacle. Sabin and Flint renewed their acquaintanceship in 1932 when Sabin wrote to ask his recollections for a biography she was writing of Mall. Flint, then sixty years old and living in Paris, returned a long, friendly letter. The two had established an active correspondence, in reminiscing mode, by the time *The Autobiography of Alice B. Toklas* was published in September 1933. An incredulous Flint sent Sabin a clipping, presumably an excerpt of the book that had appeared in *The Atlantic Monthly*: "My dear Dr. Sabin: Have you seen the enclosed? What is it? Perhaps evidence that, after all, G. S. does react to the subconscious! Or, is it a defense reaction in appropriating your experience and that of Evans to explain a failure in Medicine? Curious person. She has contributed much to the bunk of the postwar decades, but this autobiography is well written. Critics say, 'only posterity can explain her.' I rather fancy, as in the case of Joyce, posterity will never take the trouble" (Flint 1933a). Flint did not realize that posterity would indeed linger over these opaque writers and brain-twisters or that James Joyce and Gertrude Stein would be much more famous, seventy-five years later, than either Florence Sabin or Franklin Mall. In hindsight we might say that Flint's vision of the future was even more fanciful than Stein's vision of the past.

Sabin responded a few weeks later, making it clear that she was more preoccupied with her biography of Mall's life than with Stein's latest book. Nevertheless, she had taken the time to consult a copy of *The Autobiography of Alice B. Toklas* and said she wanted to set the record straight:

> In regard to Gertrude Stein, I am very happy to tell you the true story of her research. Just who started her, I am not quite sure, but I have a vague idea that it was Doctor Barker, and she was to make a model of the tracts medullated in the fetal brain of seven months. She cut her own sections and mounted them, as you may remember, on large negatives with crude balsam and isinglass. At that time we did not know that the crude balsam still contained a certain amount of turpentine and that until this turpentine was removed it would never dry. That was hardly Gertrude's fault! But you may recall that there was not a chair, table, or door knob which was not sticky for months with her balsam. She finally was failed, I think in obstetrics and perhaps one other subject, but Doctor Halsted gave her a passing mark in surgery and she told Doctor Mall that she would have respected Doctor Halsted much more if he had failed her for she really was quite innocent of any surgery. Doctor Mall enjoyed that enormously and never let Doctor Halsted hear the last of it. She came back the next year after this failure with no intention of trying for a degree, but for the purpose of writing up her model and after she left, Doctor Mall who struggled a little, I think, to follow what she had been doing, asked me to take a look at it. The bizarre forms were terribly confusing to me,

along when he was appointed to serve on the Federal Commission on Plague, investigating an outbreak in San Francisco's Chinatown in early 1901. By the fall of that year, Flint had moved to the University of California at Berkeley to direct a new anatomy department.

though, as you know, I had had a little experience in the subject. But I soon found out that she had bent the spinal cord of the soft brain forward, so that it protruded just under the frontal lobes before fixation, and that accounted for the strange and bizarre course of the tracts in her model. Doctor Mall and I consigned the study, paper, model, and all, to the waste paper basket and that is the important research which she states was used by the medical profession. The greatest sentence in her whole book is that she has met three geniuses—just imagine it!—Picasso, ?, and Gertrude Stein. When conceit is as complete as that, it certainly gives one real enjoyment (Sabin 1933).

When Sabin wrote, "as you know, I had had a little experience in the subject," she was being disingenuous. She knew full well that as author of the definitive brain atlas and judge of Stein's work, she herself had been in the position, as Meyer observes, to "set the standard against which it was judged" (Meyer 2001: 85). Flint, obviously feeling that Sabin had given him license to gossip, responded:

Thanks for your inside story of the Gertrude Stein episode. It is as I expected. She has transposed and appropriated the Evans-Sabin experiences to herself.[14] As Hans Brechtmann once said of Bernice, the Ape, "she has too much ego in her cosmos."[15] The woman has certainly learned to write, but she is typical of this whole modernistic moment which I hope will pass with the Depression. She accepts vague nonsense in lieu of concrete thoughts and ideas. She is essentially infantile and reactionary exactly as the musicians and artists go back to the tom-tom and childish ideas of colour & perspective. The only true definition of modernism in the arts that I have heard is the one John Quincy Adams gave me in response to my question. "Anything really beautiful is eternally modern!" I find I can judge any book or work of art by this standard from the aesthetic efforts of the Cave dwellers to the last Royal Academy. You may find your Student Demonstratorship useful as I have done when you run across some of the above people who accept G. S. at her own face value. I merely remark, "You know, Gertrude Stein was once a pupil of mine." That settles 'em! (Flint 1933b).

Sabin's curiosity had been piqued. When Stein gave a reading in New York in 1934, Sabin was in the audience. This was Stein's first trip to the United States—and the first time in thirty years that she would be seeing Sabin. After the reading, Sabin approached the podium to greet her former schoolmate and invite her to dinner. But Stein declined, pleading fatigue at the end of a grueling tour. That was their final meeting (Sabin 1934b). Sabin, ever discrete, never commented publicly about Stein's medical school fiasco. The incident is not mentioned in her biography of Mall and she remained reluctant to discuss it

[14] When Flint suggested that Stein's account of her failure in medicine "appropriat[ed] your experience and that of Evans," he was undoubtedly referring to Herbert McLean Evans (1882–1971). By the 1930s, Evans had become fixed in Johns Hopkins medical lore—and Joseph Flint's memory—as a brash, brilliant, independent researcher. It is unlikely that Stein could have appropriated Evans' experience because there is no evidence that the two knew one another. Flint had been Evans' undergraduate teacher at the University of California, Berkeley sometime between 1901 and 1904. Evans did indeed attend Johns Hopkins Medical School, but not until 1904, well after Stein had departed. If Sabin noticed Flint's error, she made no mention of it.

[15] I have not been able to identify Flint's reference to Hans Brechtmann or Bernice the ape.

for the record even after Stein's death. In 1947, Sabin received a query from James Montrose Duncan Olmsted, professor of physiology at the University of California, San Francisco, who was collecting materials for a never-published article about Stein's medical career (judging by the letters he solicited from a variety of Stein's contemporaries cited in Wineapple 1996; also Wineapple personal communication 2003). Sabin, by then seventy-six years old, responded reluctantly, saying she did not wish to be quoted. The pertinent portion of the letter, since reproduced in Wineapple's biography (1996: 150), reads as follows:

> Now about the neurology—she [Stein] did not work as far as I know with the Hewetson slides but rather with a baby's brain of a little later stage. I do not know with whom she worked but assume it was with Dr. Barker. At any rate she had no guidance and I imagine did not seek it. She prepared the sections herself and made a model of the medullated tracts. She came back the year after her failure to finish her model and Dr. Mall, who liked independence, and thought her attitude of not caring for the degree showed a good spirit, welcomed her back. I rather think that Leo went abroad that year. At any rate she finished her paper and I was asked to study it. The brain she had studied had been so very badly bent out of shape before fixation that one could make nothing whatever out of the form of the tracts and so the whole thing was thrown away. It was never published.

Sabin, who wanted to convey a charitable impression, gave Stein the benefit of the doubt: "Of course she must have known that she never saw a reprint of the work, but I do not know whether she was ever notified or not. My guess is not and I judge that she was entirely sincere in her statement in her autobiography that it was published. She just assumed that it must have been published and must have been good" (Sabin 1947).

REJECTING STEIN'S MODEL

Sabin's letter passes lightly over an astonishing revelation: Mall asked for her help because he could not make sense of the paper or model himself; in other words, her anatomical model was too confusing for this premier anatomy professor to interpret. When Sabin explained that Stein had badly distorted the specimen and bent it out of shape *before* it was fixed and sectioned, Mall must have been terribly offended. Stein's model was an insult to the intellectual endeavor that defined his life.[16] He probably had not considered that

[16] In January 1902, Stein sent the manuscript, along with its sixty-three drawings, to Barker for evaluation, in hopes it could be published. Barker was at that time consumed with what he considered a far more important task, preparing an address on "Medicine and the Universities" to be delivered in February (Barker 1942: 116). Consequently, he had little time to devote to Stein. He quickly perused her manuscript and wrote back a few weeks later, suggesting several improvements and adding that Mall's advice would be "valuable" (Gallup 1953: 24). Subsequent events are thoroughly analyzed in Meyer's *Irresistible Dictation* (2001: 83–106). For nearly two years her professors passed her work back and forth, each apparently hoping someone else would deal with it. Mall's evaluation of Stein's work presumably took place sometime between late January and March 1902. At least one copy of the manuscript survived the wastebasket, yet Mall remained

the assignment was designed to bring out the worst in Stein. After all, she had admitted she could not draw (Meyer 2001: 93), and her classmates repeatedly characterized her as "sloppy" (see Wineapple 1996: 124–25).[17] Barker reported that Mall had "contempt for slovenly or dishonest work" (Sabin 1934a: 139), and Sabin recalled, "A student who did poor and careless work irritated him" (1934a: 173). Yet in Mall's view, lack of artistic talent would not excuse a student from the obligation to produce an accurate model. Stein had broken this cardinal rule by not ensuring that the brain was properly positioned before she fixed the specimen. All the subsequent work—fixing, sectioning, building the model, writing a paper—had been wasted. At stake was nothing less than the integrity of anatomy as a profession.

unwilling to fail Stein outright or even to order her to "revise and resubmit" her manuscript. On 28 March 1902, he told Barker, "Miss Stein's article has been handed in for the [American] Journal [of Anatomy] & it will reach you in a few days. If you think it will do for the Journal can you not remove all unnecessary text and figures for certainly much that is known is in it. Of course it needs an introduction, acknowledgement, etc. which you must write." It fell to Knower to convey the unhappy news, but he left the final decision to Barker (Meyer 2001: 89). As managing editor of the *American Journal of Anatomy* and anatomy instructor at Johns Hopkins, Knower had recently finished editing Sabin's brain atlas (Meyer 2001: 89). Aside from Sabin herself, nobody had greater expertise or credibility regarding the subject of Stein's work. Knower undoubtedly heard about the assessment that Mall and Sabin had made, but was willing to be more forthright than Mall. On 7 April, he wrote Barker a bluntly critical letter, stating, "I do not believe she has yet measured up to your hopes. . .. Professor Mall, Dr. Sabin and myself are unfavorably impressed with the paper" (1902). Barker—dismayed, harried, and undoubtedly reluctant to render such a momentous decision from afar—replied on 9 April, "Your letter is so unfavorable to the paper, and includes besides your own opinion, so unfavorable an expression from Dr. Mall and Dr. Sabin, that I feel that I must give the whole matter very serious consideration before deciding one way or the other. I am sorry to say that it is impossible for me to give the time for such a consideration at this moment" (1902; see also Meyer 2001: 91; Schoenberg 1988: 256). Barker eventually must have conveyed the news to Stein. Stein's undated response to Barker—which has often been reproduced in its entirety—is a fascinating text in itself. Analyzed as often for its literary style, metaphors, and messy appearance as for its informational content, the letter makes quite clear that Stein had given up. "I will not be able to do any further work on the paper that I have sent to you as I am going abroad for an indefinite period," she writes (Nakajima n.d.; Meyer 2001: 94–95, 101–2; Schoenberg 1988: 255–56). Barker did finally submit the paper for publication one last time more than a year later, in October 1903, but it never appeared in print. If a copy of the manuscript survives, researchers have not located it.

[17] In giving Stein an assignment so ill-suited to her talents, Mall was likely motivated more by a principled disagreement with his colleagues than by any thought of Stein's prospects for success. In these first few years of the medical school's operation, Mall openly disapproved of the examination system used by some of his colleagues and was intent on demonstrating that examinations were a poor way to test a student's knowledge. "Many examinations," he said, "are such an utter farce, so bad and so detrimental, that both physicians and many faculties have lost faith in them entirely" (quoted in Sabin 1934a: 191). Stein admitted that some of her medical school examinations were not a test of knowledge: "The big men like Halstead [*sic*], Osler etcetera knowing her reputation for original scientific work made the medical examinations merely a matter of form and passed her" (1933: 101). Mall preferred a practical examination in anatomy, and he also "believed thoroughly that a chance for self-education was the only thing that really counted in education" (Sabin 1934a: 200). In other words, he opted to give Stein a chance to prove herself through her work, so he assigned her a practical project. We can only imagine her dismay.

Hopwood's work on embryological model making demonstrates the centrality of three-dimensional models in nineteenth-century anatomy (Hopwood and Chadarevian 2004). This was especially true in embryology because most students would not have been able to conjure up a mental image of a human embryo (Hopwood 2004: 182). By "giving body" to embryos, the embryologists made it possible for students and researchers to perceive embryos in unprecedented ways (Hopwood 1999). In this sense, the embryo models constituted the very objects that embryologists claimed to study (Hopwood 2004: 171; see also 1999; 2000; 2002). The models logically reflected the interests and worldviews of the modelers. Embryo models should mimic nature (Hopwood and Chadarevian 2004: 1); they should render faithfully what an embryologist might expect to see inside a normal physical specimen, because little could be known by examining external form. Yet, until Wilhelm His, scientists had been loathe to dissect, and hence destroy, rare existing specimens of early human embryos (Hopwood 2000: 39). In Mall's words, "The advancement of embryology has shown that it is necessary to destroy, or rather to lay into sections, the embryos before they can be studied properly" (1891: 1145). "Proper" embryological inquiry required an anatomist to ruin the embryo's anatomical integrity. In other words, the embryologists-qua-investigators were also embryographers-qua-story tellers, extolling the importance of anatomy in determining what is most real.

Contemporary embryo ideologies tend to assume a tight correspondence between embryos as scientific objects and realistic representations of them. The embryologists' scientific legitimacy is predicated, in part, on producing accurate renditions of embryos. But how is "accuracy" defined (see Hopwood 2006)? Embryographical subjects were designed to be indistinguishable from the scientific practices and visual techniques used to depict them. This was an ontological stance that required material embryo to be identical to textual and visual descriptions of them. Sabin explained her brain model by saying, "such a reconstruction would not only show graphically for the first time the form and relations of the tracts and nuclei, but that it would simplify for the student of anatomy a region both complex and difficult" (1901: 7). This understanding can be unpacked by considering alternative visions of accuracy. Imagine, for a moment, that embryologists had been steeped in feminist theory rather than anatomy. Would they have built models that depicted embryos as separate from women's bodies or from the social (and sexual) circumstances in which they were produced (see Morgan 2004)? The embryo models produced in Mall's laboratory paradoxically rooted embryos in an anatomical basis while detaching them from the anatomical relationships that linked them to particular wombs and women (Gilbert and Howes-Mischel 2004; see also Gilbert and Faber 1996). Anatomically correct models were embedded in epistemological premises that hid the social relations that (also) produce embryos; the resulting embryographies thus have to be seen as a product of the embryologists' narrative conventions, epistemological assumptions, and laboratory practices.

I do not mean to suggest that the embryologists should be faulted for constituting embryonic and fetal subjects that correspond to specific scientific enterprises. An assessment of "what it takes for images to count as proper representations" has to take account of the purposes for which they are constituted and how they are "trafficked between esoteric and exoteric circles of science" (Hopwood 2006: 262). The scientist's goals are different from those of the artist. Embryologists needed to create stable, accurate understandings of embryos that were and still are useful for the purposes of anatomy, descriptive morphology, and medical science. My point is simply to locate embryologists as authors of particular kinds of embryo stories. Like all authors, they fashion their protagonists in ways that suit their goals. This is no less true of embryologists than it is of other embryographers. If the goal is to sell 3D/4D prenatal imaging services, for example, an embryographer might set up a website called "preciousbabyimaging.com," under the banner, "The miracle of tomorrow—today!" If the goal is to oppose abortion, he or she might set up a website to feature gruesome dismembered fetuses as an "abortion gallery," sponsored by "Missionaries to the Unborn." Each of these examples claims to depict an objectively true (that is, unauthored) story. To the extent that embryo stories are cosmological origin myths, narrating us into existence, Janet Malcolm's insight into *The Autobiography of Alice B. Toklas* might be applied also to embryology: Stein "brilliantly solved the koan of autobiography, by disclaiming responsibility for the one being written" (2003: 61). As with Stein's model, today's embryo disputes are likewise imbued with historical practices of materialization, ascription of value, and adjudication.

Embryologists were scientific partisans, as evidenced by the embryographical subjects they produced. Yet even as they showed their allegiance to anatomy, their decisions about how to depict embryos were based on subjective and non-scientific contexts and assumptions (see Hopwood 2000; 2002; 2005; 2006). The embryologists were discrete or perhaps even unconscious of their biases, but their correspondence offers occasional glimpses into their cultural presuppositions and aesthetic preferences. In 1919, for example, the anatomist Charles R. Bardeen wrote to George L. Corner, then Director of the Carnegie Institution Department of Embryology, to ask that the illustrations for a forthcoming anatomy textbook be altered: "I should like to have the infant suggest a nice coat of fat, the boy and especially the youth lengthening bones, the young man muscle and the old man bones fat and tendons. I have purposely left off the external genitalia in order to reveal the height of the crotch." Inserting a caret, he scribbled, "And see I have left off the young lady. Give her beauty" (Bardeen 1919).

PRODUCING SENSE AND NONSENSE

Stein's former professors and other scientists were quick to distance themselves from Stein and her "nonsense" after the publication of *The Autobiography of*

Alice B. Toklas (Meyer 2001: 52). While Stein's reputation soared along with sales of the book, her former colleagues disdainfully dismissed her. Flint wrote to Sabin, "She accepts vague nonsense in lieu of concrete thoughts and ideas." In a similar vein, Morris Fishbein, editor of the *Journal of the American Medical Association*, pulled the physician's trump card by proposing in 1934 that Gertrude Stein might in fact be ill. He suggested she might suffer from a medical condition called *palilalia*, an aftereffect of encephalitis that would cause her to repeat phrases (see Meyer 2001: 50–54). When it was proposed that Stein should lecture at Yale during her 1933–1934 tour of the United States, the respected experimental embryologist Ross G. Harrison (Johns Hopkins 1894) huffishly told his colleagues, "I am not in favor of spending any money on Miss Stein. You could hire somebody for five dollars to recite a few words to an audience for an hour or so and it would probably be just as edifying. I am probably the only one on the University faculty to have the distinction of having been one of Miss Stein's teachers. She was a medical student at Johns Hopkins in my day there and I knew her quite well. She was just an ordinary student and I cannot believe that she has since become a genius." Harrison added that he "should not care to be held responsible, even in a small degree, for her present vagaries" (1934). Barker, writing in a more playful vein in his 1942 memoir, mused about whether *he* might be responsible for Stein's vagaries: "I have often wondered whether my attempts to teach [Gertrude Stein] the intricacies of the medulla oblongata had anything to do with the development of the strange literary forms with which she was later to perplex the world" (1942: 60). The scientists criticized Stein for nonsensical writing and brain twisting (both literal and metaphorical), touting their empiricism while ignoring the interpretive difficulties inherent in their own anatomical work.

Some of the embryologists' interpretive difficulties had to do with separating normal from abnormal variations among the diverse specimens they encountered. Hopwood points out that although embryologists collected their materials from different sources, by "treating them all in the same way" they "homogenize[d] the meaning of the objects" and "made them physically equivalent" (2000: 40). Homogenization was necessary to construct a set of normal plates or *Normentafel*, the history of which has been written by Hopwood (2005). For our purposes, it is important to note that the standardized embryological series were an important tool for embryologists who needed to stage and compare specimens. Yet the cultural effect was to blur individual variations among embryos and thus to perpetuate the notion that "embryo" could be regarded as a generic, undifferentiated object, a symbol of common human origins, rather than as a specific, contingent, socially contextualized subject.

There is nothing easy about interpreting or communicating embryo morphology. Even specialists sometimes have a hard time understanding one another. Sabin had been dispatched to Freiburg in 1901 because Ziegler could not interpret her model—even accompanied by a carefully prepared

text and exceptionally intricate drawings by the renowned illustrator Max Bröedel—well enough to replicate it in wax. When she arrived to guide Ziegler, he had insisted that they reconstruct the fiber bundles of the brain because "he could not visualize the structure sufficiently clearly from the Hopkin's artist's perspectival drawings" (Hopwood 2002: 61). Meyer points out that anatomists have long disagreed over the identity and interpretation of the nucleus of Darkschewitsch, the function of which remains unknown a century later (Meyer 2001: 78, 347–48, notes 23–25). The principals in the Stein controversy tried to reconcile conflicting accounts of that "puzzling" region of the brain (Meyer 2001: 77–78), but their models by definition exemplified anatomical concreteness rather than uncertainty, with an authority that is rarely questioned.[18] When the embryologists criticized Stein for her avant-garde abstraction and experimentalism, they discursively widened the gap between her work and their own, and positioned themselves as radical empiricists at the other end of the spectrum between objectivity and subjectivity. Mall and his colleagues attempted to secure their own epistemic authority by establishing the ontological determinacy of anatomical material, including the particular clumps of matter that we came to understand as "ourselves unborn" (Corner 1944).[19]

It was not Stein's view, says Meyer, "that objectivity and subjectivity can *never* be distinguished, only that sometimes they cannot be" (1992, my emphasis). Some literary scholars argue that Stein resisted the microscopic precision and linear narrative forms demanded by anatomical science and therefore deliberately refused to make an accurate brain model (see Meyer 2001: 92). But this interpretation overdraws the distinction between scientific factuality and Stein's "vagaries." Stein's mis-folded model—her own anatomical "composition"—was illegible to Mall and took several nights for Sabin to decipher; in other words, anatomy was rarely as clear or concrete as its practitioners liked to think or claim.[20] Embryo models, like Stein's notoriously abstruse prose, "do not try to reproduce an already-existent reality" as much as they "create the reality of their own making" (Wineapple 2002). As Stein explained her decision to build the model in a messy, typo-ridden letter to Barker, "I hadso muchdifficulty in understanding the conditions from the text books that I felt such/a clarifming process to be much needed. Not that the books do not all tell the truth as I know it but that they tell so muchmore than one is confused" (Stein n.d.) Conditions were difficult, textbooks were confusing, anatomists

[18] Maria Farland, writing of "Gertrude Stein's brain work," seems to accept uncritically the anatomists' assertion that "brain work" as exemplified in anatomical models represented the pinnacle of scientific achievement (2004).

[19] I am grateful to Meredith Michaels for helping me to sharpen this point.

[20] Curiously, similar comments were often made about Mall, who was a famously elliptical speaker and writer, forever bending his words back on themselves to obscure meaning.

themselves were vague, elliptical, and every bit as "strange and bizarre" as the obscure and experimental verse for which Stein later became known.

Did Gertrude Stein work with the brain of an embryo, fetus, or infant? I cannot say. But the inquiry inspired me to look at the embryographers who produce "true stories" about embryos. Their ideological assumptions and practices of materialization are significant, because they provide the foundation for contemporary embryographies that more often position embryos as concrete, natural entities than as cultural artifacts shaped by different kinds of storytellers with varying and unstable degrees of authority. Stein's brain modeling episode helps to clarify the processes through which embryologists, working with Progressive-era social and scientific assumptions, designed the bodily appropriations, laboratory techniques, visualization methods, and epistemological framing that would materialize the entities we now call "embryos." Perhaps most remarkable was their ability to naturalize embryos, to represent them as asocial entities "discovered" in the inner recesses of the body and to "forget the conditions, apparatuses, and histories of [their] production" (Haraway 1997: 182). In the end, I found myself identifying, quite improbably, with Stein's own untidy assessment of her modeling work: "I havebeen able I have endeavored to expres/a very clear image which exists in my own mind of a region which the existing literature of the subject leaves in a hopeless mess . . . my aim in writing this article has been not so much to give/new/ matter but to make crnfusion clear" (Stein n.d.; repr. in Meyer 2001: 94–95). Stein did indeed make a great contribution to embryology, but it had nothing to do with the murky nucleus of Darkschewitsch or other "new/ matter" of embryological anatomy. By subverting what "authorship" means, Stein clarified the presuppositions and conditions that allowed embryos to be conjured into social being. She made confusion clear.

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