Chapter 2

Immortality, In Vitro

A History of the HeLa Cell Line

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> A tissue is evidently an enduring thing. Its functional and structural conditions become modified from moment to moment. Time is really the fourth dimension of living organisms. It enters as a part into the constitution of a tissue. Cell colonies, or organs, are events which progressively unfold themselves. They must be studied like history.
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> —Alexis Carrel, "The New Cytology"

> The double is neither living nor dead: designed to supplement the living, to perfect it, to make it immortal like the Creator, it is always "the harbinger of death." It disguises, by its perfection, the presence of death. By creating what he hopes are immortal doubles, man tries to conceal the fact that death is always already present in life. The feeling of uncanniness that arises from the double stems from the fact that it cannot but evoke what man tries in vain to forget.
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> —Sarah Kofman, *Freud and Fiction*

In 1951, a piece of cancerous cervical tissue was cut from a woman named Henrietta Lacks. Lacks died eight months later of cancer. Live cells from the biopsy were grown in test tubes, supplied with nutrient medium, and kept at body temperature in an incubator. Named HeLa, from the first two letters of Lacks's first and last names, and called an immortal cell line, descendants of these original cells continue to grow and divide in laboratories around the world. Proliferating with these glass-bound populations of cells are narratives of their life and origin.

The cells live and the woman does not. They somehow stand for her and she for them; otherwise, this pair of circumstances would not present itself as a paradox, much less one that has generated such fascinated attention from 1951 to today. That one party in this relation should be alive and the other dead creates a dramatic tension which continues to generate scientific papers, newspaper and magazine articles, and television documentaries. The resolution of the paradox in these narratives is always the

same: the woman and the cells are immortal, the woman through the cells' life and the cells through the woman's death. It is a personification of the woman who died that gains immortality, while the woman's death is necessary to elevate the cells from unremarkable life—maintained in laboratories for over forty-six years—to immortal life.

It is not surprising in itself that HeLa should be personified. Cell lines are made to stand in for persons in the first place; they function in the laboratory as proxy theaters of experimentation for intact living bodies. The visualization of cellular processes by placing living cells under glass, where they are accessible to microscope and camera, has become part of what we understand to be the "life" of the body.[1] As sites of manufacturing—of viruses or proteins or antibodies—cell lines are the tools of the industry whose product is human health. Their identification as "living" and "human" entities cannot fall from them, because it is this origin that gives them commercial and scientific value as producers of biological substances for use by humans and their validity as research sites of human biology.

Given that these living technologies are thus necessarily understood to be human, I wish to ask more specifically how the material existence of the cell line redefines the designations used to describe that existence. To this end, I trace the history of the cell line and its personifications. Lacks's story is simultaneously what happened to a person and her body and a narrative vehicle through which journalists and scientists have imagined and witnessed the possibilities for lives and bodies constantly being changed by the rapid development of these "technologies of living substance" made from human tissues.[2] Lacks's photograph graces many of the accounts; the cell line bears fragments of her name; the cells bear various proportions of the genetic material of which her body was composed when it was alive, the body that was the source of cells whose varied descendants continue to live and reproduce in laboratories all over the world. However, the meaning of this material lineage is repeatedly being renegotiated in the changing personifications of the cell line.

More than an exercise in cataloguing variations on a theme, this history demonstrates how the personifications of the cell line shift alongside the development of differing experimental roles in biology, medicine, and biotechnology. The physical matter, technical practice, and economic significance of growing cells in vitro—tissue culture—generated new knowledge about and fresh meanings for the concepts of human, alive, and immortal. These are both shaped by and interact with wider cultural narratives, from modern medicine's triumph over polio in the 1950s to anxieties over race and purity in the 1960s and 1970s to, most recently, a recasting of the story in economic terms.

In a sense, I mimic the narratives I am analyzing, by structuring the following history of the HeLa cells around the changing definitions of in

vitro immortality over the course of the twentieth century. This is meant, in the end, to serve as a critique rather than a retelling; the final point of this essay is to highlight that the death of the person who was Henrietta Lacks has been obscured by the personification of her cells as an immortal entity.

IMMORTALITY IN THE HISTORY OF TISSUE CULTURE

HeLa cells were called immortal within a year of their cultivation in vitro. The only way to understand what seems a rather rapid jump to conclusions is to place the establishment of this line in the context of the history of tissue culture. This essay is not the place to recount the history of tissue culture; instead, I choose to take up a single strand of its development in the United States.[3] The work of Alexis Carrel at Rockefeller Institute in New York City from 1910 to 1938 is important in the context of this essay, because it was Carrel who first proposed the concept and the supporting technology of indefinite life of tissues in vitro. He drew his initial inspiration from Ross G. Harrison, an embryologist, who had shown in 1907 that he could keep a piece of embryonic frog neural tissue alive long enough to watch a single nerve fiber growing out from it. Harrison thus demonstrated how valuable information could be gleaned from the isolation and maintenance of a living system in which the "behavior of certain cells could be observed when removed from the bewildering conditions . . . within the embryonic body" (6).

However, it was Carrel who first tried to grow human cells in vitro. He did not aim to keep tissues alive long enough to observe some aspect of their behavior; rather, his goal was their "indefinite" or "permanent" life. Drawing on the philosophy of Henri Bergson, Carrel developed a theory of corporeal life in which physiological processes were the "substratum of duration." Time was recorded only when the metabolic products of these processes were allowed to remain around the tissues being grown in vitro:

> If these metabolites are removed at short intervals and the composition of the medium is kept constant, the cell colonies remain indefinitely in the same state of activity. They do not record time qualitatively. In fact, they are immortal. (Carrel, "Physiological Time" 620)

This theory translated into meticulous technical practices such as washing ("rejuvenating") the cells every few days, the design of special glassware for these procedures, and strict protocols to ensure asepsis. By 1912, Carrel declared the "permanent life of tissues outside of the organism" an issue only of more perfect technique, and he claimed to have established a culture of embryonic chicken heart fibroblasts. These cells would live in vitro for thirty-four years, when they were discarded two years after Carrel's death (Carrel, "Permanent Life"; Ebeling).

From its beginnings, the living cell in culture—in particular the human cell—has been an uncanny object. Tissue culture was developed using living matter cut from fetal cadavers and tumors. The living qualities of these cells, acted out in isolation from the organism and visible to the observer—contracting, beating, forming synaptic nets, proliferating, migrating—are what make them useful for biology. Their isolation gives them the character of autonomous life—which is especially evident in the early fascination of Carrel and other tissue culturists with applying new techniques of time-lapse cinematography to the study of cells in culture. These silent films of cells enlarged to screen size made visible the movement and division of entities previously seen only in the fixed, stained state of classical histology, and they enhanced the perception of an autonomous sphere of life. "Tissue and blood cells are always in the process of becoming," wrote Carrel. "They do not show their true physiognomy . . . under the microscope. . . . [C]ells appear on the film as mobile as a flame" ("New Cytology" 337).

From this early history comes not only the sense of a kind of life extracted from the confines of the animal or human body but an enduring connection with magic and sorcery. One textbook of cell biology states that "until the early 1970s, tissue culture was something of a blend of science and witchcraft," which refers both to the understanding of successful tissue culture as an "art" that had to be learned in a hands-on apprenticeship and the aesthetic setting of the early tissue culture laboratories (Alberts et al. 161). Carrel and those he trained staffed their laboratories with technicians dressed in black robes and hoods, ostensibly to minimize reflections which might interfere with the delicate operations, while the air was kept moist with "witches' cauldrons" of steam (Witowski 281). Although contemporaries and historians have blamed Carrel for making tissue culture out to be more difficult—and more occult—than it really was, thus scaring off potential practitioners, to my mind there is no doubt that his sense of the possible was extremely important to the establishment of in vitro immortality as a desired scientific object.

Getting tissue or cells to live in glass has also been the venture to get them to live indefinitely outside of the animal body. What good, after all, is a technology that only lives for a matter of days or months? Much better is one that will—if fed and maintained—reproduce itself and serve as a constant medium for repeatable experiments. However, the permanent life of cells outside of the body did not turn out to be an easily achievable goal, and HeLa was established only after years of effort with other cells, animal and human.

THE ESTABLISHMENT OF THE HELA CELL LINE

In the laboratory of George Gey and Margaret Gey, at Johns Hopkins University Hospital, the ongoing attempt to establish cell lines from human

tissues intersected with another research program to determine the relationship between two types of cervical cancer. The first was a non-invasive form of cancer involving only the epithelial surface of the cervix. The second was invasive carcinoma involving the deeper basal layers and leading to metastasis. Although it is now understood that the former is a precursor of the latter, this was still unresolved in 1951. George Gey had been recruited to the project to grow cervical cancer cells in the hope that their life under glass would reveal something about their action in the body. It was into this context that Henrietta Lacks entered when she sought treatment for intermenstrual bleeding. After initial uncertainty on the part of the Johns Hopkins' treating physicians as to the nature of the lesion they saw on her cervix, they took a biopsy of the lesion and made the diagnosis of cervical cancer.[4] Without her knowledge or permission, Lacks became part of the cervical cancer research project when a piece of the biopsy material was sent to the Gey laboratory.

In 1951, when it became clear that HeLa cells were going to continue growing and dividing unperturbed by their artificial environment, it did not take long before the label of "immortality" was applied to them and their role as a cell line quickly overshadowed any part in the cervical cancer study. George Gey distributed samples of HeLa to his colleagues around the world. Because—as one tissue culturist put it—"HeLa cells can be grown by almost anyone capable of trypsinizing cells and transferring them from one tube to another," their cultivation quickly became a widespread practice (Bang 534).[5]

Gey never attempted to patent or otherwise limit the distribution of HeLa cells, clearly not anticipating the chain letter effect of sending out cultures which were then grown up, split into parts, and sent on to others. Almost immediately, a company called Microbial Associates, Inc., began growing HeLa cells for commercial sale. In 1954, Gey expressed dismay over the number of laboratories working on HeLa in a letter to a colleague. Gey's correspondent, Charles Pomerat, reacted to this statement with some amusement:

> With regard to your statement . . . of disapproval for a wide exploration of the HeLa strain, I don't see how you can hope to inhibit progress in this direction since you released the strain so widely that it now can be purchased commercially. This is a little bit like requesting people not to work on the golden hamster![6]

Indeed, by this time, HeLa cells were being mass-produced as part of a push for the rapid evaluation of the polio vaccine, which Jonas Salk developed in 1952. HeLa cells were chosen as the "host" cell for measuring the amounts of antibodies the poliovirus antigen produced. The Tuskegee Institute, a historically black college in Alabama, was appointed by the National Foundation for Infantile Paralysis to be the locus of production. A

laboratory was committed to the sole purpose of producing as many as twenty thousand tube cultures of HeLa per week (Brown and Henderson).

George Gey had as little control over the story that he released into the public domain as he had over the cells. Because of intense national interest in the subject of polio, the HeLa cell line came quickly to the attention of journalists. Gey did not want to release Lacks's name, and so he informed an interested writer from the National Foundation for Infantile Paralysis that he could not see fit to reveal the name of the cells' donor. However, it was clear in the reply to this refusal that the writer had asked Gey's permission only as a formality; he had already learned Lacks's name.

> An intrinsic part of this story would be to describe how these cells, originally obtained from Henrietta Lakes [*sic*], are being grown and used for the benefit of mankind. Here is a situation where cancer cells—potential destroyers of human life—have been channeled by medical science to a new, beneficent course. . . .

"Incidentally," the writer smugly concluded, "the identity of the patient is already a matter of public record inasmuch as newspaper reports have completely identified the individual."[7] Another journalist writing for *Colliers* in 1954 was more discreet, referring to "an unsung heroine of medicine named Helen L." (Davidson 79).[8] Helen L. was characterized in this piece as a young Baltimore housewife whose unfortunate early death turned her into an "unsung heroine" because of the HeLa cells' research role. Her death and her immortality were uttered in the same sentence: "Mrs. L. has attained a degree of immortality she never dreamed of when she was alive, and her living tissue may yet play a role in conquering many diseases in addition to the cancer which killed her" (Davidson 80).

In this version of immortality, the cells were understood to be a piece of Henrietta Lacks that went on growing and living, encased in a test tube instead of a body. The cells were seen as universal human cells. They served as a substrate in the design of a polio vaccine that was to be applied to millions of people. They were used to produce standardized nutrient media for use in culturing all kinds of cells. They were utilized to figure out methods for growing other cells and how to produce large numbers of them. They were referred to as the "golden hamster" of cell biologists, and their concomitant personification was in the form of an angelic figure, an immortalized young Baltimore housewife, thrust into a kind of eternal life of which such a woman would never dream.

To understand how death becomes a footnote to immortality in this narrative, I will do a close reading of one of the retellings of HeLa's origin story. When George Gey died (of cancer) in 1970, his colleagues wrote a peculiar memorial tribute to him in the journal *Obstetrics and Gynecology*, entitled "After Office Hours: The HeLa Cell and a Reappraisal of Its Origin." They wrote that the original biopsy

> secured for the patient, Henrietta Lacks (fig. 2) as HeLa, an immortality which has now reached 20 years. Will she live forever if nurtured by the hands of future workers? Even now, Henrietta Lacks, first as Henrietta and then as HeLa, has a combined age of 51 years. (H. W. Jones et al. 945)

Beside this statement is figure 2—a photograph of a young woman, smiling into the camera, hands on hips. Underneath the photograph, the caption reads "Henrietta Lacks (HeLa)," as if the photograph of the woman held the image of the incipient cell line, as if the woman *was* the cell line, that according to these gynecologists, "if allowed to grow uninhibited under optimal cultural conditions, would have taken over the world by this time."[9]

The reappraisal promised by the tribute's title was another look at the original biopsy slides of Henrietta Lacks. Upon reexamining the slides, Gey's colleagues wrote that what had been originally diagnosed as epidermoid carcinoma of the cervix in its early stages was actually an adenocarcinoma, a rarer, more aggressive form of cancer involving a different kind of cell. While some readers might expect this admission to cause reconsideration of the treatment of the patient, who died within eight months of diagnosis—in particular, as one of the authors was a physician responsible for this patient's diagnosis and treatment—this is not the case. They wrote:

> while it is necessary to record that the first continuous cell strain is not of epidermoid carcinoma of the cervix . . . the exact histopathologic nature of HeLa is but a footnote to the abiding genius of George Gey. (946)

Thus the woman is paradoxically made immortal by the engine of her death, in the form of a biopsy used to diagnose her ailment (inaccurately) that becomes research material without her permission, to end up as a footnote to the abiding genius of the scientist.

The question of whose immortality is involved in the establishment of cell lines is further accentuated by the predilection some scientists showed for trying to establish immortal cell lines from pieces of their own bodies or the bodies of close relatives. In 1961, Leonard Hayflick of Wistar Institute established a cell line from his newborn daughter's amniotic sac. The amnion, which grows from the fetal tissues, was of the same genetic makeup as Leonard Hayflick's daughter, and because it carried his genes, it was literally his "daughter cell" (Hayflick, "Establishment" 608).[10] He named the cell line WISH, an acronym which stood for Wistar Institute and Susan Hayflick, his daughter.

In 1966, Monroe Vincent was diagnosed as having a benign tumor of the prostate. He promptly attempted to grow some of the cells taken from his prostate, and he established the cell line MA160, named not after himself but after the biomedical supply company Microbial Associates, Inc., in which he was a partner. HeLa was itself scientific progeny—letters to

George Gey referring to HeLa called the cell line "your precious baby."[11] Gey is fondly remembered for hand-delivering the cultures personally to other scientists: "'He would put his glass tubes containing the cells in his shirt pocket, use his body heat to keep them warm, and then fly to another city and hand them to a fellow scientist.'"[12]

FROM BENEFICENCE TO NOTORIETY

This benign version of immortality came to an abrupt end in the 1960s. First, new scientific work that studied aging through cell culture revealed that only cancerous cells had the ability to keep dividing indefinitely. This drew a sharper line of definition between normal and cancerous cells. Carrel's famous immortal chicken heart cell culture had supposedly been composed of normal cells, in which "permanent life" had been induced by removing them from the body and manipulating their environment, but in 1961 this was shown to have been something of a fraud, when Hayflick demonstrated that normal somatic cells in culture consistently divide for a set number of generations and then all die at once. Cells reproduce by replicating their DNA and dividing into two daughter cells. When a whole population of cells goes through division, it is said to double. Hayflick showed that cells taken from human fetal tissue will always undergo about fifty doublings before dying. Even if the culture is frozen, and no matter how long it stays frozen, when thawed it will pick up where it left off and in total complete approximately fifty doublings. Cells taken from adults consistently go through about thirty doublings (Hayflick, "Biology").[13] What is more, the finite number of doublings is species-specific. Chicken cell culture will go through thirty-five doublings at the most, not thirty-five years worth of doublings. Thus it seemed impossible that Carrel's culture could have been composed of normal chicken cells.

Hayflick concluded that the chick embryo extract preparation used as nutrient medium for Carrel's cultures provided new viable embryonic cells at each feeding. Others have hypothesized that Carrel's proximity to Peyton Rous at Rockefeller Institute led to the normal somatic chicken cells being infected with Rous sarcoma virus and thus rendered capable of the same kind of unlimited division seen in cancerous cells (for example, see Harris 45). The cause for the famous culture's immortality could not be investigated as it was thrown away in 1946.

More important was the stark distinction drawn between normal body cells and cancer cells with this work. Intrinsic to this distinction was the finite life span of populations of normal cells, a limit only cancer cells could break. Normal somatic cells were euploid, that is, contained a normal number of chromosomes. Cancer cells were aneuploid, showing abnormal chromosome numbers. Immortality was not available to normal euploid cells except through freezing. They could be "transformed" with

a virus or mutagen, but then they became aneuploid and behaved like cancer cells.[14] Immortality was thus a characteristic solely of cancerous, aneuploid cells, and it was one of the traits that made cancer a menacing and mortal disease of the body.

Malignancy and cancer were already associated with uncontrolled cell proliferation and metasticization, but it was not until after 1966 that HeLa cells were understood or described in these terms. Certainly it was recognized that HeLa cells came from the cancerous tissue that caused Henrietta Lacks's death, but the emphasis had been on their control by scientists, their harnessing as producers of knowledge in the victorious battles against polio, and the less successful but still hopeful attempt to understand and contain cancer. This sense of control came to an abrupt end with the second and more profound disruption of a benign image of in vitro immortality.

This disturbance was the announcement that HeLa cells had contaminated and overgrown many of the other immortal human cell cultures established in the 1950s and 1960s. Because one human cell looks much like another, only cross-species contamination—which could be seen by counting chromosomes—had up to this time been identified in cell culture. This changed with the introduction of techniques of genetic identification. At the Second Decennial Review Conference on Cell Tissue and Organ Culture in September 1967, geneticist Stanley Gartler announced that he had profiled eighteen different human cell lines and judged them all to have been contaminated and overtaken by HeLa cells.

Gartler had tested the eighteen lines electrophoretically for a set of enzymes known to be genetically polymorphous, that is, to differ slightly among different people. All eighteen cell lines contained exactly the same enzyme profiles, indicating that they were all the same rather than eighteen distinct human cell types. All eighteen had the same profile as the HeLa cell. The key piece of evidence in this study was the profile for a particular enzyme called G6PD (glucose-6-phosphate dehydrogenase), which is a factor in red blood cell metabolism. Gartler stood up in front of an audience of tissue culturists and said:

> The G6PD variants that concern us are the A (fast) and B (slow) types. The A type has been found only in Negroes. . . . The results of our G6PD analyses of these supposedly 18 independently derived human cell lines are that all have the A band. . . . I have not been able to ascertain the supposed racial origin of all 18 lines; it is known, however, that at least some of these are from Caucasians, and that at least one, HeLa, is from a Negro. (Gartler, "Genetic" 173)

The terminology of cell culture was already dense with the connotations of lineage, culture, proliferation, population, contamination, and, most recently, malignancy. With the delivery of this paper, Gartler used these

terms in a scientific explanation which marked the contaminating cell line as black and the contaminated lines as white.

At this moment, the narratives surrounding the HeLa cell changed dramatically. Prior to Gartler's work in 1966, race had not entered into the discussions of either HeLa cells or their donor, Henrietta Lacks. In fact, Gartler had to write to George Gey early in 1966 to ask about Lacks's race.

> I am interested in the racial origin of the person from whom your HeLa cell line was initiated. I have checked a number of the early papers describing the development of the HeLa cell line but *have not been able to find any information pertaining to the race of the donor.*[15] (emphasis added)

After 1966, the race of the donor was central to the scientific evidence of cell culture contamination, and metaphors and stereotypes of race framed scientific and journalistic accounts of the cell line.

The following analysis traces this transformation of scientific and popular rhetoric in detail. It is not sufficient to assert that one discourse of contamination merged with one of miscegenation, as if this were the inevitable course of events. It was by no means inevitable; I argue that Gartler emphasized the least sound piece of his repertoire of evidence of contamination, an error which was then promulgated by those who tested, extended, and reported on Gartler's work. This particular course of events reveals much about the functioning of concepts of biological race in American biology in the late 1960s and 1970s.

First, it is necessary to support my assertion that Gartler emphasized the weakest part of his evidence of HeLa contamination of other cell lines, keeping empirically stronger arguments in the background as supporting evidence. Gartler did not have to explain his results in the manner he did, highlighting the G6PD typing. When he tested each of the cell lines for particular enzymes, he was looking for variations in structure between the same genes in different humans. The resulting enzymes differ slightly in amino acid sequence, a difference which can then be visualized as lines on a gel. In addition to G6PD, Gartler also used three other sets of polymorphic electrophoretic variants. Each of these three variants occurs in differing proportions across the world's population, much like blood types, and could not be categorized as being specific to any one population. In Gartler's own words, the statistical likelihood of all eighteen cell lines carrying the same profiles for these systems of polymorphisms was statistically "absurdly low," regardless of the purported race of the various donors of the cells (Gartler, "Apparent" 750). In other words, Gartler's evidence of contamination would have been conclusive even without any reference to racial difference.

Any eighteen people, in particular eighteen unrelated people from the diverse population of the United States, would show different enough en-

zyme profiles to be distinct from each other. The same enzyme profile for all eighteen would be strong evidence of contamination of all of them by the same cell line. Thus an explanation based on human genetic variation, which lurked in the background of Gartler's paper as supporting evidence, was empirically more sound than that which he chose to highlight, the G6PD types and their supposed racial correlations.

The presence of G6PD type A or B in a cell culture was correlated in his account with the racial categorization of the patient donor as black or white, a categorization presumably noted by the physician-scientist on the basis of the patient's self-designation or the physician's visual assessment. The correlation implied an equivalence of the two kinds of racial categorizations—by G6PD variation and visual judgment. Gartler suggested that an apparently white donor could not have been the origin of a cell line expressing G6PD type A, which is not true at all. This weakness was noticed by the founder of one of the cell lines said to be contaminated by HeLa. As this was a commercially marketed cell line, contamination was a threat to its economic value. Almost immediately, Monroe Vincent—whose cell line was made from his prostate—published a denial that MA160 was HeLa-contaminated. He hypothesized that the G6PD type A in MA160 could be inherited from potential remote "Negro ancestry" in his lineage (Fraley et al. 541).

Even with this weakness, G6PD continued to be the main marker in testing for HeLa contamination of cell lines. The consequence of this emphasis was the essentialization of cells as "black" or "white"—an error possible only in the prevailing confusion about concepts of biological race. An essential black/white difference was simpler for Gartler to explain and easier for his audience to understand as "proof" than would an explanation based on human genetic variation. This fact indicates that the concept of population had not yet managed to displace the concept of race for these biologists. Gartler had been working since the early 1960s with a cell culture that carried a mutation at the G6PD locus, and as a geneticist he was well acquainted with the voluminous literature concerning the incidence of G6PD variation in populations around the world. However, his audience of cell biologists was not trained in population genetics, nor were these cell biologists familiar with its methods. Their responses gave G6PD type A a simplified, essentialized status as a "black gene," as if the register of race went from skin to cell to enzyme to gene. This marker, taken from the context of population genetics and used as an identifying test for contamination in cell culture, lost all the subtleties and complications of a gene frequency within a population and became, instead, an absolute indicator of difference.[16]

Once the lines between cell types were demarcated in this fashion, the crossing of these boundaries meant that the scientific community experienced two simultaneous disruptions. First was the disruption of a compla-

cent sense of control. If Gartler was right, these scientists had mistakenly been doing experiments on cells that they thought were breast cancer or colon cancer or amnion cells but were in fact all HeLa cells. This was a threat to the integrity and value of past work, an imputation of carelessness in their technical practice, and the sudden switch from HeLa as a founding success to HeLa as the source of catastrophe. Second, it was the disturbance of a previously unarticulated presumption of race. There had been no "information pertaining to the race of the donor" to this point, and in its role as a breakthrough, a standard, a universal, HeLa and its concomitant personification as an angelic and immortal Henrietta Lacks were unmarked and assumed to be white.

At the same time, the synecdoche between cell and person functioned to make the cell populations of petri dishes analogous to populations of people. The scientists moved readily between the language of cells in culture to that of people in culture. One respondent to Gartler's paper stood up to remind the audience that cross-species contamination occurred easily in tissue culture, a statement which exemplifies the facile slide from "human cell" to "human":

> We all remember clearly a number of years ago—maybe 5—when this contamination business began and everybody was very defensive: the L cells contaminating the rabbits, the HeLa cells contaminating the mouse. . . . Now, here comes the HeLa: human contaminating human.[17] (Hsu 191)

Human contaminating human, explained in terms of racial difference, meant an immediate introduction of the metaphors of miscegenation. The immediacy of this response is better understood within the larger context of American history.

The late 1960s saw the arguing of the landmark United States Supreme Court case of *Loving v. Virginia*, ruling in 1967 that the Virginia miscegenation law was unconstitutional. As in science, the validity and utility of racial categories were being challenged. This ruling was followed by a general move on the part of most American states to repeal statutes that defined racial categories, usually by blood proportion (Pascoe 67–68). This included the "one drop of blood" rule which defined a person as black if they had so much as a single drop of black blood. Miscegenation laws, present from the 1660s to the 1960s, asserted an absolute interdiction of sexual or marital crossing of the racial border. However, the existence of the one drop rule, and its aim to demarcate black from white absolutely, admitting no middle ground, indicated that this border was crossed all the time. Originating in American slavery, when the master's rape of the female slave was an "open secret," the one drop of black blood criterion and miscegenation laws worked to deny any kinship across racial boundaries (JanMohammed).

That these boundaries were still anxiously regarded—and that kinship

across them was still being denied—is evident in the audience discussion after Gartler delivered his paper. There was a great deal of defensive rejection of his conclusion of widespread HeLa contamination from these members of the tissue culture community, some of whom had founded the cell lines Gartler was identifying as contaminated. Leonard Hayflick's WISH—the cell line made from his daughter's amniotic sac—was one of the cell lines Gartler identified as carrying the genetic marker he said was "found only in Negroes" ("Genetic" 173). Hayflick, apparently a white man, is reported to have stood up during the discussion following Gartler's paper and said "'I have just telephoned my wife, who assured me that my worst fears are unfounded'" (qtd. in Gold 30). Themes of miscegenation and pollution, the fear of impregnation of the white woman by the black man, and doubt in the genealogy of the scientists thus came to the fore within minutes of Gartler's conclusions.

After Gartler made his argument about HeLa contamination, the description of what happened to cells in culture was structured by these metaphors of miscegenation. Scientists passed on this explanation to journalists, who used this narrative to tell the HeLa story to a larger audience. The scientists also read the journalists' accounts, footnoting them in their scientific papers. The warnings about the danger of HeLa contamination, for example, played up a "one drop of HeLa" theme: "If a non-HeLa culture is contaminated by even a single HeLa cell, that cell culture is doomed. In no time at all, usually unnoticed, HeLa cells will proliferate and take over the culture" (Culliton 1059). One drop was enough.

The racial metaphors altered but did not completely change the way tissue culture had been understood up to this point. Even with the earlier famous chicken heart cell culture, there was a consistent obsession with hypothetical calculations of the total volume of cells the immortal culture produced; with HeLa, these were calculations of a swamping of a white population by a black one. Ross Harrison had mused in 1927 that had it been possible to allow all of the cells in Alexis Carrel's chicken heart culture to multiply, it would "now greatly outweigh the terrestrial globe," while in 1937 P. Lecomte De Noüy envisioned the same set of cells reaching a volume "more than thirteen quatrillion times bigger then the sun" (Harrison 18; De Noüy 104).[18] This "mathematical calculation" abruptly became a threat, a literal "fear of a black planet" in the case of HeLa. The calculation was of a fleshliness that not only outweighed the globe but threatened to take it over: "HeLa, with a generation time of about 24 hours, if allowed to grow under optimal cultural conditions, would have taken over the world by this time" (H. W. Jones et al. 947). The calculation of the putative volume of the culture when "allowed" to multiply freely was not just of a cell culture but of how much Henrietta Lacks would weigh now, if all her cells were to be put back together—an "incredible amount" (Curtis).

Gartler's findings and methodology were taken up by Walter Nelson-Rees, director of a cell culture laboratory at the University of California, Berkeley, who was charged by the National Cancer Institute with keeping stocks of standard reference cells. Starting in 1974, Nelson-Rees began publishing lists of cell lines he judged to be HeLa-contaminated—an alarmingly high number. Contamination proved to be widespread. It is impossible to estimate how much research was invalidated by the findings that the researchers were mistakenly working on the wrong type of cell. Contaminated cell lines included a set of six cell cultures given to American scientists by Russian scientists under a biomedical information exchange that Nixon and Brezhnev negotiated in 1972 (Nelson-Rees et al. 751).

High profile incidents such as these, the emphasis on the "provenance" of cell lines (one of Nelson-Rees's favorite terms), the consistent use of the G6PD marker system, and Nelson-Rees's penchant for personifying HeLa cells all contributed to a revived interest in the figure of Henrietta Lacks in the 1970s and into the 1980s. The inability of scientists to explain why HeLa contaminated other cultures, but rarely the other way around, fed into a characterization of the cells as voracious, aggressive, and malicious.

A large number of articles about HeLa and Henrietta Lacks appeared in magazines and newspapers from *Science* to *Rolling Stone* between 1974 and 1977. Unlike the writers in the 1950s, these authors were not interested in the figure of the self-sacrificing housewife. Although cell cultures were being identified by this time by karyological studies—the appearance of their chromosomes—and a number of other systems of genetic polymorphism not characterized as specific to black or white populations, cell identity was still being explained primarily through the G6PD system. HeLa cells were depicted as having a distinct, identifiable biological race due to their particular genetic structure. Michael Rogers, reporting in the *Detroit Free Press,* explained this to his readers by writing, "In life, the HeLa source had been black and female. Even as a single layer of cells in a tissue culture laboratory, she remains so" (D4).

This identity as black and female was combined with a character described variously as "vigorous," "aggressive," "surreptitious," "a monster among the Pyrex," "indefatigable," "undeflatable," "renegade," "catastrophic," and "luxuriant." The narrative of reproduction out of control was linked with promiscuity through references to the cell's wild proliferative tendencies and its "colorful" laboratory life. Rogers reported that he first heard about Henrietta Lacks through graffiti on the wall of the "men's room of a San Francisco medical school library" (D1). Nelson-Rees, the self-appointed watchdog of HeLa contamination for the cell culture community, was fond of talking about the appearances of "our lady friend." When describing the letters Nelson-Rees wrote to his fellow biologists when he suspected they were working with HeLa-contaminated cell lines, an-

other journalist wrote, "It was like a note from the school nurse informing the parents that little Darlene had VD." Problems of contamination of cell lines were described as the scientific community's "dirty little family secret" (Gold 63, 64, 72).

In the personification of Henrietta Lacks as promiscuous and lascivious, in the characterization of HeLa cells as akin to venereal disease, in the facile linking of race and contamination, and in what I call the "one drop of HeLa" narratives of miscegenation and hybridity, I see the long reach of what Hortense Spillers has called the "American grammar" of race, that "the ruling episteme that releases the dynamics of naming and valuation remains grounded in the originating metaphors of captivity and mutilation" (68). The distressing literality of the excision, cultivation, exchange, mutation, and sale of a living, reproducing fragment of a black woman's cervix—without her or her family's knowledge or permission—evokes Spillers's theorization of the "captive body," as that which has been severed from its motive will and active desire. The captive body is "culturally unmade" by becoming "a thing for" the captor, removed and renamed (67).

I would argue further, that the racialized rhetoric of contamination is not something apart from the immortality narratives that I discussed earlier. With Gartler's 1967 bombshell to the tissue culture community, the desired scientific progeny—the immortal cell line—the "precious baby," exhibited more autonomy than was expected or wanted of it and the promise turned to menace. The baby transformed into a monster, supplanting and destroying more legitimate scientific progeny, such as the tokens of political good will on the part of Russian scientists, the WISH line, and Monroe Vincent's prostate cells. Because this transformation was detected and narrated in terms of racial difference, the already menacing aspect of malignant immortality became inextricably wound with a threat to scientific order and a set of racial and sexual metaphors of contamination and miscegenation.

These anxieties provoked by the HeLa cells' repetitive appearances are underpinned by the more general transgressions of the object of the immortal cell line across understandings of the life and death of intact bodies. Tissue culture was designed as a microcosm of the human body; it is the double, made for the visualization of disease processes and as the stuff of experimental practice. In some cases, it is made from the bodies of the experimenters. This double, as Sarah Kofman observes, is "neither living nor dead"; it is "designed to supplement the living, to perfect it, to make it immortal" (148)—but faced with this double, there is a shock, a lack of recognition.

CONCLUSION

The two forms of immortality that I have gone through here—the beneficent immortal chicken heart, wonder fathered by modern science, cells in

a test-tube body form of immortality, and the racialized, malignant, out-of-control immortality have both functioned to deflect attention from what mobilized them in the first place—Henrietta Lacks's death. This is evident in the treatment of her apparent misdiagnosis as a footnote to scientific genius. It is also manifest in the volatile, threatening personification arising from the contamination narrative.

This effacement of death has not dropped away with the 1990s version of the HeLa story. Rather, the immortalized Henrietta Lacks has taken on a distinctly economic cast. In media accounts, she has become a figure of economic exploitation, with a contemporary right to sue for compensation. Lacks has become personified as the holder of an investment account, where the original capital was those first biopsy cells (for example, see Stepney). These should have had a dollar value from the beginning, because look what they would be worth today, after all these years in the investment account that is the burgeoning biotechnology industry. Lacks's family is cast into the role of the rightful heirs to the proceeds of this "investment" who cannot collect, because nobody ever patented the cells and thus it is difficult to pin down either past or present profit, or any one party who could benefit from the commercial exchange of HeLa cells and all their products and permutations.

Race reenters the story here as demarcating lines of economic power and privilege. As one of George Gey's colleagues commented to him in 1954, it was "out of the goodness" of Gey's heart that HeLa cells, only three years after their establishment, had become "general scientific property."[19] As a black woman from a black family, Henrietta Lacks walked into a clinic at Johns Hopkins University Hospital, where there was no institutional, ethical, or legal framework to ensure that she or her family was in a position to execute any kind of decision—out of the goodness of their hearts or otherwise—as to the fate of the cells.

Her family and friends, long left out of the story, are now being interviewed as key players in a drama where Henrietta Lacks's cells became important tools of modern medicine without her or her family's permission. With contemporary awareness that significant tools of modern medicine are also valuable commodities, endless reproduction and worldwide distribution remain part of a story of Lacks's immortality, but the metaphors have become those of the growth of capital and those of miscegenation and contamination have retreated into the background of the story.

An analysis of the significance of this story to contemporary discussions of the body as property, the implications of laws which allow for patenting of living organisms and materials, and other cases of immortal cell lines made from human tissues remains to be written. In anticipation of these concerns, this essay has attempted yet one more return to the origin of the HeLa cell line. What this return had indicated is that at the establishment of this cell line exists a moment of irredeemable silence. Lacks's illness and

treatment in 1951 at Johns Hopkins took place in an institutional, cultural, and scientific setting that had no room in it for heroic agency or any other expression of personal will on her part, even the simple act of donation. Recognition of this absence places the establishment of the first immortal human cell line and the science of tissue culture within the long and troubled history of human experimentation (see Lederer).

The relationship between immortal cell lines and human experimentation has been obscured by a "false and misleading plenitude" of personification.[20] This functions to animate the cells with an autonomous will, as though they were beneficent or malevolent independent of the scientific apparatus and constant tending that maintains their "life" in the laboratory. The narrative of immortality—beneficent, malignant, or monetary—masks the death at its origin. Although it is difficult to say whether an accurate diagnosis of adenocarcinoma would have helped in Lacks's treatment, the total absence of questioning of the circumstances and adequacy of her medical treatment—even with the clearly stated admission of diagnostic error published in 1971—indicates the power of the concepts of immortality produced by the life of these cells.

The HeLa cell line, even though referred to as an individual entity with a clear physical relation to an individual named Henrietta Lacks, does not exist in a single place, is not a tiny vial containing an ever-living cell. The cells grow and divide, are split up to make new cultures, and are distributed to live and divide further in laboratories around the world. Various generations of them remain in stasis, stored in the freezers of cell culture banks. The original biopsy was a piece of tissue, not a single cell, and there exist many subtypes of the HeLa cell line. HeLa cells have been used for years as one part in hybridization procedures which merge two kinds of cells to make a new and distinct cell line. To speak of the HeLa cell line is to speak of a distributed, heterogenous thing which is always growing, multiplying, and changing.

HeLa thus serves as its own metaphor. It is not a story to which there is a single conclusion. Immortality, the uncanny double, and the cultural, scientific, and individual effects of ideas of biological race have existed in an intricate reciprocity with the matter and practice of the science of tissue culture in this history. The resulting personification of HeLa simultaneously captures and erases human experience of this twentieth-century biomedical reach toward the technical alleviation of aging and death.

NOTES

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1. Cellular "life" and the synecdoche between cell and body do not remain stable over time, and they are part of a larger history of the twentieth-century life sciences than I can address here. For an in-depth analysis of the rhetorics of "life," see Doyle.

2. The phrase "technologies of living substance," which I believe is an appropriate description of tissue culture, is taken from a letter Jacques Loeb (1859–1924) wrote to Ernst Mach in 1890 about Loeb's ambitions for a biology that would manipulate, transform, and control living matter (Pauly 4). See also Rabinow for a discussion of a more recently established cell line.

3. For more detail on the history of tissue culture, see Susan M. Squier, this volume.

4. Before any biopsy was taken, Lacks's physicians sent her to be tested for syphilis, and this detail should be viewed in the context of American medical history. James H. Jones has written about the characterization of American blacks as a "notoriously syphilis-soaked race" by a white medical establishment and the role of this perception in the founding of the Tuskegee syphilis experiments to track the course of the disease in untreated black males. Elizabeth Fee, in an analysis of Baltimore in the first half of the twentieth century, writes that the situation there was similar to the South; venereal diseases among the black population were seen "as both evidence and consequence of their promiscuity, sexual indulgence, and immorality" (182). In the context of this history, Lacks's being sent to the syphilis clinic reveals to some extent the doctors' perception of the patient; furthermore, when this event reappears as part of the narrative of the origin of the HeLa cell, the cell line is personified with metaphors of promiscuity and contagion.

5. Trypsinizing means shaking the cells apart by using the digestive enzyme trypsin.

6. Charles Pomerat, letter to George Gey, 5 March 1954, George Gey Papers, Alan Mason Chesney Medical Archives, Baltimore. All letters cited are quoted with permission from the George Gey Papers.

7. Ronald H. Berg, letter to George Gey, 24 November 1953. Berg was referring to a story that had appeared in the *Minneapolis Star* in 1954 and gave Lacks's name, although it is unclear who released the name.

8. After this point, there is a proliferation of pseudonyms made from the HeLa letters: Helen Lane and Helen Larson are two of these, probably spread by Gey, who was startled to find that Lacks's real name had leaked out without his knowledge and thought that a fictitious name would serve equally well.

9. As was the case with the biopsy cells, this photograph is used in this and many other publications, such as a 1973 textbook of medical genetics, without any indication that permission was sought or given for its use, either from Lacks or her family.

10. When a cell divides, the two resulting cells are referred to as daughter cells.

11. C. M. Pomerat, letter to George Gey, 19 February 1954.

12. Dr. George Gey, Jr. (qtd. in Kelly A1).

13. Thanks to Anne Fausto-Sterling for pointing out the importance of aging research to this story.

14. "Transformation" is the technical term used to describe an event such as a

mutation, chromosomal rearrangement, or viral infection after which cells in culture grow to higher densities, in several layers rather than a monolayer, and cause tumors when injected into animals. This event can either occur spontaneously or be induced.

15. Stanley Gartler, letter to George Gey, 16 March 1966.

16. Donna J. Haraway has described the concepts of race and population in biology circa 1950–1970 as follows: "Occasionally still a convenient notion, 'race' was generally a misleading term for a population. The frequency of interesting genes, like those coding for immunological markers on blood cells or for different oxygen-carrying hemoglobins, might well differ more for individuals within a population than between populations. Or they might not; the question was an empirical one and demanded an explanation that included consideration of random drift, adaptational complexes, and the history of gene exchange" (343).

17. T. C. Hsu then equivocated by adding, "-if it is HeLa," reflecting the series of skeptical questions the alarmed audience directed at Gartler.

18. Thanks to Evelyn Fox Keller for this source.

19. Charles Pomerat, letter to George Gey, 5 March 1954.

20. "We return to those empty spaces that have been masked by omission or concealed in a false and misleading plenitude" (Foucault 135).

WORKS CITED

Alberts, Bruce, et al. *Molecular Biology of the Cell.* 2nd ed. New York: Garland, 1989.

Bang, Frederick. "History of Tissue Culture at Johns Hopkins." *Bulletin of the History of Medicine* 51 (1977): 516–37.

Brown, Russell, and James Henderson. "The Mass Production and Distribution of HeLa Cells at Tuskegee Institute, 1953–1955." *Journal of the History of Medicine* 38 (1983): 415–31.

Carrel, Alexis. "The New Cytology." *Science* 73 (1931): 331–45.

———. "On the Permanent Life of Tissues outside of the Organism." *Journal of Experimental Medicine* 15 (1912): 516–28.

———. "Physiological Time." *Science* 74 (1929): 618–21.

Culliton, Barbara J. "HeLa Cells: Contaminating Cultures around the World." *Science* 184 (1974): 1058–59.

Curtis, Adam. Interview. BBC Radio. 14 Apr. 1997.

Davidson, Bill. "Probing the Secret of Life." *Colliers* 14 May 1954: 78–83.

De Noüy, P. Lecomte. *Biological Time.* New York: Macmillan, 1937.

Doyle, Richard. *On Beyond Living: Rhetorical Transformations of the Life Sciences.* Stanford: Stanford University Press, 1997.

Ebeling, Albert H. "Dr. Carrel's Immortal Chicken Heart." *Scientific American* Jan. 1942: 22–24.

Fee, Elizabeth. "Venereal Disease: The Wages of Sin?" *Passion and Power: Sexuality in History.* Ed. Kathy Peiss and Christina Simmons. Philadelphia: Temple University Press, 1989. 178–98.

Foucault, Michel. "What Is an Author?" *Language, Counter-Memory, Practice.* Ed. Donald Bouchard. Trans. Donald Bouchard and Sherry Simon. Ithaca: Cornell University Press, 1977. 113–38.

Fraley, Elwin E., et al. "Spontaneous *in vitro* Neoplastic Transformation of Adult Human Prostatic Epithelium." *Science* 170 (1970): 540–42.

Gartler, Stanley. "Apparent HeLa Cell Contamination of Human Heteroploid Cell Lines." *Nature* 217 (1968): 750–51.

———. "Genetic Markers as Tracers in Cell Culture." *Second Decennial Review Conference on Cell Tissue and Organ Culture, September 1967*. National Cancer Institute Monograph 26: 167–90.

Gold, Michael. *A Conspiracy of Cells: One Woman's Immortal Legacy and the Medical Scandal It Caused*. Albany: State University of New York Press, 1985.

Haraway, Donna J. "Universal Donors in a Vampire Culture: It's All in the Family: Biological Kinship Categories in the Twentieth-Century United States." *Uncommon Ground: Toward Reinventing Nature*. Ed. William Cronon. New York: Norton, 1995. 321–66.

Harris, Henry. *The Cells of the Body: A History of Somatic Cell Genetics*. Cold Spring Harbor: Cold Spring Harbor Laboratory Press, 1995.

Harrison, Ross G. "On the Status and Significance of Tissue Culture." *Arch. exp. Zellforsch* 6 (1927): 4–27.

Hayflick, Leonard. "Biology of Human Aging." *American Journal of the Medical Sciences* 265 (1973): 433–45.

———. "Establishment of a Line (WISH) of Human Amnion Cells in Continuous Cultivation." *Experimental Cell Research* 28 (1962): 14–20.

Hsu, T. C. "Discussion of Genetic Markers in Cell Culture." *Second Decennial Review Conference on Cell Tissue and Organ Culture, September 1967*. National Cancer Institute Monograph 26: 191–95.

JanMohammed, Abdul R. "Sexuality on/of the Racial Border: Foucault, Wright, and the Articulation of 'Racialized Sexuality.'" *Discourses of Sexuality: From Aristotle to Aids*. Ed. Donna Stanton. Ann Arbor: University of Michigan Press, 1992. 94–116.

Jones, Howard W., et al. "After Office Hours: The HeLa Cell and a Reappraisal of Its Origin." *Obstetrics and Gynecology* 38 (1977): 945–49.

Jones, James H. *Bad Blood: The Tuskegee Syphilis Experiment*. 2nd ed. New York: Free, 1993.

Kelly, Jacques. "Her Cells Made Her Immortal." *Baltimore Sun* 18 Mar. 1997: A1+.

Kofman, Sarah. *Freud and Fiction*. Trans. Sarah Wykes. Oxford: Polity, 1991.

Lederer, Susan. *Subjected to Science: Human Experimentation in America before the Second World War*. Baltimore: Johns Hopkins University Press, 1995.

Nelson-Rees, Walter, et al. "HeLa-like Marker Chromosomes and Type-A Variant Glucose-6-Phosphate Dehydrogenase Isoenzyme in Human Cell Cultures Producing Mason-Pfizer Monkey Virus-like Particles." *Journal of the National Cancer Institute* 53 (1974): 751–57.

Pascoe, Peggy. "Miscegenation Law, Court Cases, and Ideologies of Race in Twentieth-Century America." *The Journal of American History* 53 (1996): 44–69.

Pauly, Phillip. *Controlling Life: Jacques Loeb and the Engineering Ideal in Biology*. Berkeley: University of California Press, 1990.

Rabinow, Paul. "Severing the Ties: Fragmentation and Dignity in Late Modernity." *Essays on the Anthropology of Reason*. Princeton: Princeton University Press, 1996. 129–61.

Rogers, Michael. "The HeLa Strain." *Detroit Free Press* 21 Mar. 1976: D1+.

Spillers, Hortense. "Mama's Baby, Papa's Maybe: An American Grammar Book." *Diacritics* 17.2 (1987): 65–81.

Stepney, Rob. "Immortal, Divisible: Henrietta Lacks Died 40 Years Ago but Her Cells Live On and Multiply." *Independent* 13 Mar. 1994: 50.

Witowski, J. A. "Alexis Carrel and the Mysticism of Tissue Culture." *Medical History* 23 (1979): 279–96.