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## Suffering For Science

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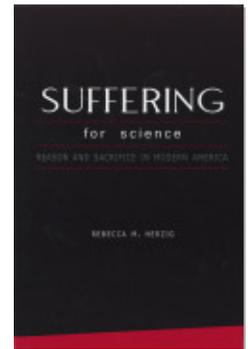
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# Introduction

## Truth at Any Price

In 1802, a medical student from New Jersey named Stubbins Ffirth sought to determine the cause of contagion for yellow fever, a disease then so widespread that it was often referred to as the “American plague.” At the time of Ffirth’s investigations, prevailing wisdom held that the fever spread through its characteristic “black vomit,” a discharge darkened by the victim’s internal bleeding. To determine whether the vomit did in fact convey disease, Ffirth collected a large quantity of it from dying fever patients. Then, on the fourth day of October 1802, Ffirth began to experiment: “I made an incision in my left arm, mid way between the elbow and wrist, so as to draw a few drops of blood; into the incision I introduced some fresh black vomit.”<sup>1</sup>

After the inflammation stemming from the initial incision subsided, Ffirth obtained some additional “fresh black vomit” and inserted it into his other arm. Once this second incision also healed without incident, Ffirth continued to expose himself to the purported contagion: he dropped black vomit in his eye; he cooked black vomit in a skillet and inhaled its rising steam; he vaporized some black vomit and spent two hours in a small, hot room breathing the resulting fumes; he swallowed pills made from black vomit; and he quaffed a solution of water and recently ejected black vomit. After this series, Ffirth flirted briefly with the idea of “desisting from any further experiments” but ultimately remained steadfast in the variation and repetition of his trials.<sup>2</sup> Upon concluding that black vomit did not cause the fever, the meticulous Ffirth then undertook another set of experiments on his own body, this time with the blood, saliva, perspiration, bile, and urine of yellow fever victims.

Ninety-eight years later, a small group of people undertook a second set of experiments with yellow fever, this time performed under the auspices of the U.S. army surgeon general. The Yellow Fever Commission, also referred to by the name of its head researcher, Walter Reed, was comprised of four physicians:

Reed himself, Aristides Agramonte, James Carroll, and Jesse Lazear. Building on Cuban physician Carlos Juan Finlay's proposal that yellow fever was conveyed by mosquitoes, several members of the surgeon general's commission traveled to Cuba to test the theory. The researchers fed a number of the insects on the blood of yellow fever patients and then captured the infected mosquitoes in glass tubes. Two of the commission members, Jesse Lazear and James Carroll, placed the tubes against their forearms and abdomens, allowing the mosquitoes to feed on their blood. Both Carroll and Lazear quickly fell ill with the fever; and twelve days after the experiment commenced, Jesse Lazear died, delirious and vomiting. After Lazear's death, the team conducted another round of experiments, this time using volunteers from the army medical corps and a number of recent emigrants from Spain. Combining the evidence from all of the experiments, the Reed Commission proclaimed the mosquito, an intermediate host, to be the agent of yellow fever transmission.<sup>3</sup>

At first glance, the experiments conducted by the Reed Commission mirror those performed a century earlier. Like the investigators in Cuba, Ffirth sought to solve the riddle of yellow fever, was committed to experimentation in the resolution of that problem, considered his own body an appropriate experimental tool, and publicized the results of his investigations. Yet the surface similarities between the two episodes quickly dissolve to reveal their more profound differences. Quite unlike Ffirth, the men involved in the Reed experiments were hailed in their own time as noble sufferers, willing to sacrifice their lives for science. Reed, although himself not actually on the island at the time of the historic self-infections, was soon the beloved subject of dozens of sculptures, paintings, and articles.<sup>4</sup> He took honorary degrees from Harvard and the University of Michigan and ultimately became the namesake of the most prestigious army hospital in the United States, wherein American presidents often still receive medical treatment. The experiments themselves were later recounted in a number of popular forms, including Sidney Howard's hugely successful play, *Yellow Jack*, and a lucrative Hollywood film of the same name.<sup>5</sup> To the question, Is it worth a human life to find the cause of yellow fever? one best-selling 1926 book declared that members of the Reed Commission boldly answered yes.<sup>6</sup>

Narratives of self-sacrifice were not limited to popular representations of the Reed experiments. Descriptions of noble martyrdom were equally prevalent in the original reports of the experimental results in professional journals, congressional records, and international scientific meetings. Surgeon General George Sternberg described Lazear as a "highly esteemed" gentleman who died "a martyr to his scientific experiment."<sup>7</sup> Writing in the journal *Medical Record* in 1901, head researcher Reed similarly stressed the special moral character of the experimenters. His fallen colleague, Reed wrote, displayed "manly and fearless devotion to duty such as I have never seen equaled. In the discharge of [his duty], Dr. Lazear seemed absolutely tireless and quite oblivious of self. Filled

with an earnest enthusiasm for the advancement of his profession and for the cause of science, he let no opportunity pass unimproved.”<sup>8</sup> John Kissinger and John Moran, two Americans who volunteered for further experiments after Lazear’s gruesome death, were also alleged to have done so “solely for the cause of humanity and in the interest of science.” The men reportedly accepted the life-threatening task only on the condition that they receive no financial compensation for it.<sup>9</sup>

In contrast, the “cause of science” that figures so prominently in Walter Reed’s account is entirely absent in Ffirth’s report. Ffirth neither presented his actions as demanded by science nor used the language of manly sacrifice when reporting his findings. That Ffirth repeatedly attempted to infect himself with an incurable and deadly disease merited no special comment in his treatise on fever.<sup>10</sup> His only articulated hopes for the experiment were (1) the preservation of human life and (2) the revision of ill-conceived quarantine laws.<sup>11</sup> While Ffirth did remark on the “valour of Fredonia’s sons” who fought for colonial independence, the rhetoric of soldierly mettle never bled into his experimental undertakings.<sup>12</sup> In short, no matter what sorts of things Ffirth might have been doing with black vomit, he never hinted that his actions were undertaken on behalf of science. Less than a century later, however, the significance of the scientist’s voluntary suffering was readily apparent, if not fully understood. As one periodical responding to the deaths of Lazear and other experimenters noted in 1901, such expenditure for the “sake of science” represented a “form of self-sacrifice with which we are not familiar, and to which we have not yet adjusted ourselves.”<sup>13</sup>

Emerging in the space between these two trials is the possibility of imagining science as an entity worthy of self-sacrifice and the concurrent possibility of imagining scientists as those unusual persons willing to suffer and die in its name. That these possibilities were not yet taken for granted—that Americans had not yet “adjusted themselves” to suffering for science—is evident in the outpouring of statements on sacrifice by and about American scientists that began after 1875. “Higher than all,” declared the editors of the new national journal *Science* in 1883, science “must be devoted to the truth. It must cheerfully undertake the severest labor to secure it, and must deem no sacrifice too great in order to preserve it.”<sup>14</sup> Mathematician George Bruce Halsted echoed this sentiment in 1896, urging investigators to “sacrifice all unflinchingly” for science, “the benign empress of our modern world.”<sup>15</sup> Physicist Michael Pupin carried the theme into the twentieth century, affirming that a life of science “cannot be attained without unceasing nursing of the spirit and unrelenting suppression of the flesh.”<sup>16</sup> From diverse disciplinary, institutional, and regional locations, such commentators called on individual investigators to surrender physical comfort, material gain, and social solace for the sake of science. The writings they generated reveal not only an important presumption about the relative value of scientific knowledge (as one chemist put it in 1895, “a human life is nothing

compared with a new fact in science”) but also two far more critical claims: that the advancement of science *requires* painful self-sacrifice and that scientists are uniquely willing—even eager—to take on this pain.<sup>17</sup>

This book follows these twined themes, elucidating the conditions in which late nineteenth-century Americans came to characterize science as an autonomous and exacting entity and scientists as those subjects specially beholden to its costly demands. It shows how these two mutually constitutive figures—masterful science and submissive scientist—were enabled and sustained by the pliant ligature binding them together: self-sacrifice.

The very word *sacrifice* displays this pliancy. Derived from the Latin *sacer*, it wobbles between the contrary roots “hallowed” and “detestable.”<sup>18</sup> While retaining the elasticity of its classical cousin, the decidedly more recent term *self-sacrifice* (the *Oxford English Dictionary* lists William Wordsworth’s 1805 “Ode to Duty” as its earliest use) introduces all the further equivocation contained in modern concepts of self. Confusingly, the self is at once subject and object of the self-sacrifice, the agent determining action and the substance acted upon. The layered connotations of self-sacrifice help explain its prominence in writings of the late nineteenth century, when received relationships among selfhood, personhood, property, and embodiment were in the process of being upended and reworked. Wherever self-sacrifice flourished, we find deliberation on these relationships: scrutiny of the nature of free will, the purpose of suffering, and the limits of reason. The book’s central concern, in the end, is with such deliberations—that is to say, with changing constitutions of the human.

Through this examination of bodies, selves, and persons, I revisit several of the central issues of the Gilded Age and Progressive Era, including relations between religiosity and secularism, tensions between industrialization and democratization, and connections between racial and sexual exclusion and liberal political traditions. With respect to these wider subjects, the book presents three interwoven claims. First, I show how self-sacrifice for science, an ethic forged by the larger upheavals of Civil War and Reconstruction, presupposed a distinctly privileged kind of self, one characterized by specific histories of property, personhood, and civic participation. Self-sacrifice implied a willing surrender of one’s person (that is, one’s property); but only some bodies were historically endowed with the kind of self-ownership requisite to such willful, free forfeiture. Second, I emphasize the paradoxical quality of that social privilege: a power made evident through scientists’ sunken eyes, emaciated bellies, and bloody stumps. The blurring of power and vulnerability, elevation and humiliation, and pleasure and pain evident in sacrifice for science reflects not only the abiding influence of Protestant doctrines of salvation but also the received contradictions of the modern liberal subject. Third, I demonstrate that the ambiguities inherent to voluntary suffering spawned a set of persistent questions for late nineteenth-century scientists: just what might be gained by forgoing

sleep, skipping meals, or forfeiting limbs? Were such “sacrifices” relinquishments made with no expectation of return, or were they acts of calculated reciprocity—bartered for some new reward of equal or greater value? As will be seen, commentators’ discordant responses to these questions point to the consequential new role then being allotted to science: the task of addressing and answering perennial problems of ultimate meaning and purpose.

These interwoven threads become more readily apparent if we return to the Reed yellow fever experiments. Given continued U.S. military presence in Cuba after the Spanish-American War, the freedom of individuals on the island was in question in the American, Cuban, and Spanish presses even before the famous trials. As historian Susan Lederer reports, to quell concern over the free will of volunteers in the experiments (particularly the independence of the recent emigrants from Spain), Reed took the then unusual step of requiring individual written consent forms and restricting participation to those over the age of twenty-four, the age of consent in Spain.<sup>19</sup> When publishing their experimental findings, Reed and his colleagues were similarly careful, stressing that “all experiments were performed upon persons who had given their free consent.”<sup>20</sup>

Despite Reed’s careful efforts, free consent remained a slippery category: only some bodies were apprehended as fully consensual and hence as authentically sacrificial. Participants fell beneath the standard of sacrificial subjectivity by contractually consigning themselves for money—that is, by bartering their bodies rather than offering them without expectation of return. The receipt of payment, one hundred dollars in gold, suggested obligation to the payer and thus troubled the understandings of free gift (and autonomous selfhood) inherent to the concept of self-sacrifice. As a result, the newly arrived Spanish emigrants, who accepted gold for their participation in the experiments, generally were unacknowledged in the numerous memorial tributes to the “martyrs” of the experiment constructed at the time. Other tangible forms of memory—monetary awards, plaques, statues, medals, honorary degrees, textbooks—reproduced this exclusion, highlighting the “manly devotion” of Carroll, Lazear, Kissinger, and Moran and ignoring the illnesses and deaths of others.<sup>21</sup> Similar patterns of differentiation appear in each of the examples discussed in the book. For one’s action to be self-sacrificial, it must be freely chosen. Freedom, however, was always malleable and situation: a contingent, relational attribute determined by specific historical conditions.

These conditions were in flux after 1875 as the United States concluded the lengthy, bitterly contested transition from slavery to free labor. As previously dispossessed subjects came to own their own bodies, to be “persons” in that liberal sense, they acquired the freedom to sell or rent their bodily capacities. The elevation of market exchange as the model of all relations among persons thus thrust to the fore the nature of consent, the principle of individual liberty upon which such relations of exchange were based. In this setting, as historian Amy

Dru Stanley has shown, the contract became at once a material transaction (an identifiable set of legal and economic associations) and a figurative tool (a generalized vocabulary for framing the relationship between self and other). Paradoxically, the growing importance of consensual contract, which determined individual volition to be the defining element of the self, highlighted the obligations and imperatives of life under industrial capitalism.<sup>22</sup> Scientists joined other late nineteenth-century Americans in coming to terms with renewed forms of coercion and endeavoring to delineate some fundamentally inalienable, free self. Like labor reformers, freed slaves, feminists, and bonded immigrants, scientists struggled to live with the dilemmas of consent and compulsion, liberty and obligation effected by the abolition of slavery and the concurrent expansion of industrial capitalism.

Self-sacrifice raised the specter of obligatory exchange in an especially acuminate way. The phrase *self-sacrifice* implies a loss suffered, an uncompensated expenditure, an unrestricted offering. A sacrifice, *Webster's* summarizes handily, is "something given up." For scientists as well as for artists, theologians, military officers, and the other late nineteenth-century Americans enamored of the phrase, the normative power of self-sacrifice lay precisely in this meaning: in its confounding of the usual logic of consensual exchange. As one proponent put it, "a sacrifice which involves no real loss and impoverishment, or which ultimately leads to personal gain, is not true self-sacrifice."<sup>23</sup> To remain outside the bounds of ordinary transactions in the marketplace, the offering of self must not be restituted. The calculated sacrifice ("is it worth a human life to find the cause of yellow fever?"), a gift tendered with expectation of return, implies no sacrifice at all. At stake in scientists' calls for self-sacrifice was thus not merely the value of the parts of the self surrendered as compared to the forms of knowledge obtained: whether, say, some new fact was "worth" a whole finger or just the tip. More important, the matter at hand was whether science might present an alternative to the tyrannical logic of the marketplace—whether it could, or ought to, be freed from the profane presumptions of the self-interested contractual exchange.

Such dilemmas were the subject of helpfully explicit debate among the scientists described in subsequent chapters: university-based researchers in the 1870s and 1880s, polar explorers in the 1890s and 1900s, X-ray experimenters in the 1900s and 1910s, and the fictional bacteriologists depicted in Sinclair Lewis's 1925 *Arrowsmith*. Discussions of will, reason, and sacrifice recur across their diaries and letters, funeral orations and inaugural addresses, laboratory notebooks, and published reports. That many of these writings were ritualistic in nature does not dampen their utility as sources for historical analysis, for even their rhetorical excesses suggest the significance of governing norms and ideals. Drawing on these sources, I map the place of self-sacrifice during a pivotal moment in the history of American science. From the 1870s to the 1920s and be-

yond, a malleable ethic of voluntary suffering helped unite practitioners marked by increasing institutional diffusion and specialization as members of the imagined, undying body of science.<sup>24</sup>

To be sure, the cases discussed in this book are not comprehensive. Most of the “Americans” of whom this study speaks spent their lives in northern states, many in New England.<sup>25</sup> While their positions afforded them the ability to present their local experiences as those of the nation as a whole, it is worth remembering that their assertions about America were, like any others, always partial. When I describe the claims of a few investigators as indicative of larger national trends, I do so because to some degree these investigators were correct in sensing themselves to be at the center of American scientific work. By 1845, Boston surpassed all other U.S. cities in numbers of scientists in residence (despite having merely a fraction of the population of Philadelphia or New York), and the region’s influence over the direction of the sciences in the United States persisted into the twentieth century. Although this handful of elite New England scientists was by no means wholly representative of all inquiry ongoing within U.S. borders, scientific centers held disproportionate influence over the shape and character of research in the peripheries, as they continue to do so today.<sup>26</sup>

Similarly, as much as the examples I selected stress the prominence of self-sacrifice in the five decades after Reconstruction, voluntary suffering was by no means the only standard of scientific progress available in the late nineteenth century. Some commentators emphasized the importance of the fortuitous scientific accident, as in Antoine-Henri Becquerel’s discovery of natural radioactivity (said to have resulted from leaving some uranium rocks in a drawer containing photographic plates) or Luigi Galvani’s theory of “animal electricity” (said to have been detected when a charged metal scalpel happened to contact the bared nerve of a dissected frog). Others emphasized the pleasure and merriment of scientific pursuits: ethnologist Steward Culin (1858–1929), for example, often underscored the importance of childish play in the generation of new knowledge. Serendipity and ease vied with voluntary suffering in numerous late nineteenth-century accounts of scientific practice. While there was never universal accession to calls for suffering, self-sacrifice did prove consequential during a period of profound transformation in the shape and scope of scientific labor. This book seeks to explain why, given the existence of other, less painful alternatives, so many scientists chose to align themselves with this ethos and considers, however speculatively, some of the lasting ramifications of this decision.<sup>27</sup>

OF COURSE, nineteenth-century American scientists were not the first to affiliate knowledge with pain. Varied experiences of suffering have long pervaded representations of the contemplative life. In the dominant traditions of western intellectual history, the passage from ignorance to enlightenment has been portrayed as ineluctably arduous and bloody, if not downright lethal. From Plato’s

den-dwellers scraping their way out of the allegorical cave to the *Agamemnon*'s claim that "wisdom comes alone through suffering" (*pathos mathei*), classical Greeks crafted particular associations between truth and pain.<sup>28</sup> Suffering's value as a sign of chosenness, as an elect point of access to holy wisdom, has also been central to Jewish philosophical traditions, evident not only in the Hebrew Bible but also ancient and medieval rabbinic literature.<sup>29</sup> Early Christians, in turn, developed their own gruesome customs of suffering—drinking pus, whipping themselves with nettles, and so forth.<sup>30</sup> Even today, the age-old affinities between truth and suffering persist in mundane ways, coagulating around English words such as *painstaking* and *labor*. To "take pains" with a task is to move it closer to perfection.<sup>31</sup>

Despite the obvious longevity of the affiliation between truth and pain, the striking recurrence of self-sacrifice in late nineteenth-century science begs further explanation. For the persistence of voluntary suffering defies the common belief that detachment from such customs is precisely what distinguishes science from other forms of knowledge—that science is, in anthropologist Sharon Traweek's phrase, a "culture of no culture."<sup>32</sup> A well-established body of scholarly literature arises from just such a supposition, positing a crucial break in the early modern period. At this time, the literature suggests, an "invisible, autonomous, virtual" observer displaced the embodied ascetics of previous knowledge traditions.<sup>33</sup> Where classical Greeks or medieval Christians might have needed to suffer in order to access truth, the modern scientific knower is said to be freed from such requirements—indeed, freed from bodily specificity and individuality altogether. Michel Foucault promoted this view in an essay written shortly before his death:

In European culture up to the sixteenth century, the problem remains: What is the work I must effect upon myself so as to be capable and worthy of acceding to the truth? To put it another way . . . asceticism and access to truth are always more or less obscurely linked.

Descartes, I think, broke with this when he said, "To accede to truth, it suffices that I be *any* subject that can see what is evident." . . . After Descartes, we have a nonascetic subject of knowledge. This change makes possible the institutionalization of modern science.<sup>34</sup>

In other words, modern science is distinguished by the fact that one no longer need be among the elect—divinely chosen, morally superior—in order to generate knowledge. With the institutionalization of modern science we acquire, perhaps for the first time, the potential to access truth *without* suffering. We have now the "nonascetic subject" of knowledge: any subject can see what is evident.

Given the claim that the institutionalization of modern science enabled the separation of knowledge from the character of the one generating that knowledge, how are we to make sense of the enduring presence of the suffering sub-

ject, to understand the tenacity of late nineteenth-century scientists' cries for voluntary sacrifice?

The answer to this question may be found, in part, in the work of those historians, sociologists, and philosophers of science who, in opposition to Foucault, emphasize the ongoing importance of practices of self-constitution in the production of knowledge.<sup>35</sup> Their studies suggest that an ascetic care of the self, including the rigorous regulation of sleep, exercise, diet, and sexual behavior, remained vital to the generation and guarantee of reliable knowledge long after the "break" allegedly marked by Descartes.<sup>36</sup> The contributions of historians Lorraine Daston, Peter Galison, and George Levine have been especially crucial in this respect. Like Foucault, these scholars detect a consequential shift in the nature of the knowing subject, but they place this turn in the nineteenth century, in the shift from Enlightenment ideals of truth to modern notions of objectivity. So divergent were these two positions, Daston proposes, that "proponents of objectivity were sometimes willing to sacrifice accuracy or even truth for its sake."<sup>37</sup>

Even as objectivity marked a break with traditional ways of knowing, however, it maintained some links to earlier practices of the self. An idealized "view from nowhere" presumed a new kind of individual, the subjective self, to which objectivity was opposed. Investigators were encouraged to bury this subjective identity in the "impersonal collectivity" of science, an epistemological ideal which Levine aptly terms "dying to know."<sup>38</sup> Put differently, we might say that care of the self remained fundamental to the generation of knowledge even after the shift from truth to objectivity in the nineteenth century, after the institutionalization of science described by Foucault; but such care became a practice of self-formation in the service of a quite different end. In the age of objectivity, the self is constituted in order to be willfully forfeited.<sup>39</sup>

Given the relevance of "dying to know" to modern notions of objectivity, and given the centrality of objectivity to transnational practices of scientific investigation in the nineteenth century, it is not surprising to find references to suffering among scientists in other national contexts. From the tribulations of Alexander von Humboldt to the wounds of Marie Curie, examples abound of investigators who suffered, often highly visibly, in other settings of modern science.<sup>40</sup> Consider the Duke of Sussex's praise for renowned English astronomer John Herschel at one 1838 dinner. As the large crowd bellowed its approval ("hear, hear"), the speaker recounted how Herschel's strenuous research had been surmounted only by that of a colleague who "died a few years ago a victim to his arduous exertions, in the study of astronomy."<sup>41</sup> Or consider the influential experiments in nerve regeneration conducted by Henry Head and W.H.R. Rivers at St. John's College. After Head had most of the nerves in his left hand and forearm surgically severed, he and Rivers began a series of tests on the sensitivity of the rehabilitating nerves. From 25 April 1903 (the date of the original

operation) until 13 December 1907, the two Fellows of the Royal Society met regularly in Rivers's college chamber to apply varying amounts of heat, cold, and pressure to Head's mangled arm and the shaft of his penis. "When the needle was brought into contact with the skin, such as that of the body of the penis, H. was at once conscious that he was being touched with a pointed object. . . . if a sensitive spot had been chosen, H. cried out and started away."<sup>42</sup> As these and myriad other examples attest, American scientists were hardly exceptional in their promotion of volitional suffering; and subsequent chapters recount some of the more important ways in which they adapted norms and practices of sacrifice from other national contexts.

The endurance of the suffering subject in American science, however, is only partly explained by the advent of transnational ideals of objectivity. An equally crucial explanation for scientists' cries for voluntary sacrifice can be found in developments specific to their location. Just as American scientists were not alone among scientists in stressing the necessity and value of voluntary suffering, neither were scientists the only proponents of voluntary suffering to be found in the United States. As this book demonstrates, scientists were part of a much broader invigoration of self-sacrifice during the last quarter of the nineteenth century. In the aftermath of the Civil War and Reconstruction, several trends converged to transform attitudes about suffering held by the well-to-do, including a long tradition of Protestant martyrology, the diffusion of Darwinism, and the steady spread of industrial capitalism. The educated and affluent came not only to naturalize the connection between suffering and advancement but also to glorify it. Voluntary suffering appeared as a cleansing purgative for the nation's gluttonous economic life, a way to renew the moral solidity of a bygone era. By 1870, few men and women of letters blanched when Henry Ward Beecher declared suffering to be the universal "measure of value."<sup>43</sup> Against a backdrop of violent labor strikes, the widespread lynching of African Americans, and continued bloodshed over Indian lands, the pampered began to clamor for pain. Accordingly, a number of white middle-class activities were re-described in lavishly sacrificial terms. As the ideal investigator was newly lauded for sacrificing himself for science, so, too, the ideal citizen was presumed to offer his life for his country, the artist his life for his art, and the Christian his life (or, less frequently, her life) for God.<sup>44</sup>

I have focused this study of voluntary suffering on American scientists (rather than, say, American mothers) due to the unusually influential character of scientists' engagement with self-sacrifice. Unlike self-sacrificing artists, soldiers, or mothers, scientists both claimed *to* suffer and made authoritative claims *about* the definition of suffering itself: which acts of suffering were normal and which were deviant, which were natural and which were unnatural. Scientists' efforts to document the nature of suffering are evident in numerous

examples: in their increasingly elaborate racial taxonomies of pain, their assessments of appropriate and inappropriate uses of anesthesia, and their novel diagnoses of masochism (circa 1886), algolagnia (circa 1901), and other so-called perversions.<sup>45</sup> Another crucial index of late nineteenth-century scientists' rising ability to define and certify suffering is the emergence of sacrifice itself as a distinct object of scientific inquiry. In the massive outpouring of studies such as William Robertson Smith's *Lectures on the Religion of the Semites* (1889), Henri Hubert and Marcel Mauss's *Essai sur la nature et le fonction du sacrifice* (1899), Sir James George Frazer's *The Golden Bough* (1890), Emile Durkheim's *Les formes élémentaires de la vie religieuse* (1915), and William James's *The Varieties of Religious Experience* (1902), writers drew on the increasing legitimacy of science to materialize sacrifice as an empirically demonstrable phenomenon.<sup>46</sup> Quite unlike the self-sacrificing businessman or soldier, the self-immolating scientist could claim to unveil the nature of suffering itself, to reveal "the voice of God . . . in facts."<sup>47</sup> In this respect, late nineteenth-century scientists would soon stand on par with clergy in their ability to influence broader understandings of the nature of suffering.

Scientists' own practices of voluntary suffering—interminable hours spent gathering specimens, painful habits of self-experimentation, perilous ethnological observations, and so forth—were often the very means by which they generated new understandings of pain and volition. Even as scientists were arrogating the authority to sort truly deliberate, self-chosen suffering from mere masochism or barbarism, they themselves embodied such distinctions. They made statements about suffering's true nature even as they enacted, through the medium of their bodies, broader assumptions about the value of suffering. Few other sufferers played such a complicated role, at once trumpeting their own voluntary suffering and reshaping knowledge about suffering itself.

Given the unusual position in which scientists found themselves, maintaining the *reason* for and of one's suffering—establishing that it was freely and purposefully chosen—was therefore of paramount importance, lest the scientist's decision to pass a fourth consecutive evening without sleep or to deliberately contract a deadly disease appear demented. And as one of the central strands running through this book seeks to make clear, the boundaries of reason, the lines between sacrifice and barbarism or pathology, were reliant on other forms of stratification: heroic scientist versus inconsequential indigenous assistant, willing martyr versus perverse masochist. The ability to be a sacrificial self, in other words, was always structured by the ability to consent, itself dependent on one's embodied "location in the material world."<sup>48</sup> Possession of an intentional, free self, a prerequisite for self-sacrifice, was a quality defined only in relation to bodies said to be lacking intention and freedom—in contrast to those bodies in which, as Toni Morrison writes, "the self that was no self

made its home.”<sup>49</sup> While suffering might, as William James put it, “redeem life from flat degeneration,” it could do so only for those historically endowed with the self that was.<sup>50</sup>

When explicating varied relations between selves, bodies, and persons in the pages that follow, I employ a range of terms once used to attribute specific characteristics to individuals: *scientist, man, woman, Negro, Chinese, American, slave, citizen, civilized, pathological*, and so on. I forgo incessant quotation marks around such words. I hope it will remain evident throughout that my aim is not to reproduce these categories but to describe the processes by which they were brought into being, contested, and inhabited. The point is not simply to show how different bodies were imbued with different meanings but to illuminate how these bodies came to be differentiated in the first place.<sup>51</sup> To this end, I draw on recent critical historical scholarship on race and sex, which reveals how renewed emphasis on fasting, self-flagellation, and other forms of voluntary suffering in the last quarter of the nineteenth century helped assuage concerns about the changing status of the white American man.<sup>52</sup> To understand self-sacrifice, then, we will first explore the changing contours of freedom and self-possession in nineteenth-century America, particularly their dependence on records of coercion and dispossession.

While I attend to the mutually constitutive relationship between scientists and nonscientists throughout the book, I want to emphasize my abiding focus on the figure of the self-sacrificing scientist, whose paradoxes form the second strand of this study. There are, of course, countless others involved in scientific investigation, including laboratory animals, wives and children, technicians, and other experimental subjects. These others, already skillfully addressed in previous studies, have their own distinctive relationships to the imagined body of science and their own tales of suffering and sacrifice.<sup>53</sup> While the book does address the ways in which practices of self-formation were entangled in practices of domination (for, in the words of literary theorist David Savran, “a penchant for pain by no means rules out the possibility of turning violence against others”), the voluntarily suffering self remains my primary concern.<sup>54</sup> This book is intended to call attention to the forms of domination that elite investigators exercised upon themselves.<sup>55</sup> Attention to these forms of domination reveals a scientific self bristling with uncomfortable contradictions—at once robust and mangled, potent and vulnerable. Following Jesse Lazear and his contemporaries, we are introduced to a subject simultaneously hallowed and detestable, for whom progress occurs only through suffering and liberty requires continuous displays of bondage.

A certain empathy with this ambivalent self prompts the third and final strand of this history of self-sacrifice, a query that initially directed this study: given the presumption that advancement necessitates personal suffering, how did these individuals decide how much of themselves to give? On what grounds

were such difficult decisions made? To what end, for what reasons, did these investigators choose to suffer for knowledge?

As subsequent chapters make clear, such questions of reason and purpose were the subject of helpfully explicit debate in the late nineteenth century. In some settings, sacrifice implied calculated exchange—suffering endured with the expectation of the return of equal or greater value. For these advocates, sacrifice appeared eminently generative, destined to return advantageous salaries, professional renown, and useful knowledge to those who weighed their decisions judiciously and wagered appropriately. The American delegates to an 1883 international meeting on the proposed standardization of time and longitude, for instance, reported that the “scientific and practical utility” of joining the international standard “far outweighs the sacrifice of labor and the difficulties of re-arrangement which it would entail.”<sup>56</sup> Sacrifice remained an inescapable component of scientific advancement in these portrayals, but proponents framed the relationship as founded on self-evident principles of exchange. The relevant question for these commentators was simply one of predictive accounting: in what sense expenditures were balanced by expected returns. The “only thing to be certain of,” one writer reflected in the wake of the lethal Reed experiments with yellow fever, “is that the knowledge gained is worth the possible sacrifice of human life.”<sup>57</sup> Again, sacrifice remained firmly within the logic of contract; all that was needed was a clear sense of the price of the capacities surrendered—that is to say, of the relative value of human life.

In other settings, however, the relationship between scientist and science appeared to exceed such reasoned calculation. In these instances, sacrifice signaled divestiture, offerings made expressly because they carried no assurance of return. “Everyone has heard of a meeting of ‘men of science;’” one writer recalled in 1921, who toast science “with the acclamation, ‘May it never be of any use to anyone.’”<sup>58</sup> Those scientists seeking to counteract the siren voices of materialism, commercialism, and utilitarianism elevated sacrifice precisely because it denied the logic of compensatory exchange.<sup>59</sup> It was the nonreciprocal character of the scientist’s labors that assured his separation from the degradation of the modern marketplace. For such advocates, the very meaning of the scientific endeavor lay in the fact that the relation between scientist and science was one of gift rather than contract.

An influential chemist stressed the widespread misunderstanding of this point in 1895: “the most curious misconception is that . . . the aim of science is the cure of disease, the saving of human life. Quite the contrary, the aim of science is the advancement of human knowledge at any sacrifice of human life.”<sup>60</sup> For other period commentators featured in this book, sacrifice similarly evokes something closer to orgiastic potlatch than to temperate, planned dispensation. Wounds and privations are treated not as part of a balanced, reciprocal system of exchange but as demonstrations of forfeiture, as acts *not* repaid in kind.<sup>61</sup> A

few commentators argued that any effort to put a price to the scientist's suffering was inherently misguided since the exchange could never be assured; after all, one wrote, "only God knows what a fact's worth."<sup>62</sup> The evident lack of economic calculation in the scientist's labor released him from the stench of the contract.

It may be tempting to contend that such references to uncompensated expenditure should not be taken at face value, to insist that scientists' alleged self-sacrifices actually resulted in considerable individual and professional gain. This interpretive stance would hold that whether consciously calculated or not, those who declared disdain for pecuniary or intellectual reward often reaped the tangible benefits of that posture. Some explorers, for example, invoked the romanticism of the commercially futile "polar quest" to hawk everything from motor oil to Bibles; some investigators maintained profitable consulting contracts even while extolling ceaseless devotion to "pure science." Professed aversion to utility and compensation, one might argue, could prove extremely useful—generating increased publication, professional influence, patentable innovations, institutional mobility, and other forms of symbolic capital or financial resources.

However tempting it may be, I invite readers to join me in resisting such an interpretation. While I do note discrepancies evident in various accounts of self-sacrifice, I do not endeavor to root out the eventual personal or collective gain lurking beneath references to deliberate loss. To approach this historical study seeking only to learn how scientists profited from seeming acts of forfeiture would be to miss a subtler and far more interesting point: what was to be gained through voluntary suffering was exactly what was in dispute at the time. From the perspective of the individual trying to decide whether to labor one more hour without food, to march one more mile out into the field, or to run one more experiment before retiring for the night, the outcome of these activities could never be certain, nor could the sensibility of the decision to engage in them. Indeed, it was precisely the enigmatic character of such decisions—of what might be achieved through one's action upon the self—that made the ethic of sacrifice so labile and hence so socially potent.<sup>63</sup>

I use the word *ethic* in this context (rather than *concept*, *trope*, or *discourse*) for two reasons. First, an ethical frame helps circumvent a simple division between the rhetoric of sacrifice and the "real" experience of suffering it might be said to conceal.<sup>64</sup> Of course, a single act (such as deliberately exposing oneself to yellow fever) might be interpreted by others in qualitatively different ways: as the Ffirth and Reed experiments show, one act might be seen as so routine as to hardly bear mention, while another is rewarded as noble martyrdom, while a third is castigated as gold-grubbing insensibility.<sup>65</sup> I here seek to distinguish between such interpretations while remaining attentive to the specific, concrete practices that render them consequential. Frostbitten toes, distended stom-

achs, and ulcerated fingers became self-sacrifice (as opposed to accidents or pathologies) only once claimed as deliberate, voluntary contributions to science's ceaseless advancement—and only then when claimed by a particularly located self. Second, an ethical frame helps to maintain a delicate balance between the individual and the collective, an apprehension of the role of social norms in organizing and inspiring action that does not neglect the significance of the acting person. As Stephen J. Collier and Andrew Lakoff explain, problems of ethics—of how one should live—necessarily involve “a certain idea of practice ('how'), a notion of the subject of ethical reflection ('one'), and questions of norms or values ('should') related to a certain form of life in a given domain of living.”<sup>66</sup> Approaching self-sacrifice as one such “problem of ethics,” this book seeks to understand the interplay of practices, subjects, and norms in the domain of late nineteenth-century American science.

Perceptive period observers on both sides of the Atlantic recognized the fundamental problems of ethics posed by the practice of science. As Max Weber posited in his famous 1918 speech, “Science as a Vocation,” whether “what is yielded by scientific work . . . is ‘worth being known’” can never be ascertained “by scientific means.” The value of the scientist's offering can “only be *interpreted* with reference to its ultimate meaning, which we must reject or accept according to our ultimate position towards life.”<sup>67</sup> Other commentators of the era similarly suggested that participation in science depended on some prior faith in its purpose, one every bit as unsubstantiated as belief in God's good will.<sup>68</sup> Ultimately, William James observed in an address to Harvard Divinity students in the fall of 1884, even the scientist's efforts must be remanded to the realm of unreasonable devotion. The scientist's assumption that truth is worth pursuing is “as much an altar to an unknown god as the one that Saint Paul found at Athens. All our scientific and philosophic ideals are altars to unknown gods.”<sup>69</sup> Reaching similar conclusions in 1887, Nietzsche emphasized the violent excesses of this faith. The conviction that “truth is more important than any other thing,” the “unconditional faith” on which science rests, cannot arise from a reasoned “calculus of utility.” Indeed, this faith “must have originated *in spite of* the fact that the disutility and dangerousness of ‘the will to truth,’ of ‘truth at any price’ is proved to it constantly. ‘At any price’: how well we understand these words once we have offered and slaughtered one faith after another on this altar!”<sup>70</sup>

At stake in such provocative reflections, as in our own contemporary assessments of the meaning of sacrifice, is nothing less than the status of the human: the nature of individual freedom, the purpose of suffering, and the possibilities for real and lasting progress. For the scientists discussed here, such enduring questions were the matter of everyday practice as well as grandiloquent philosophical reflection, embodied not only in inaugural addresses and funereal orations but also in each skipped meal and lost hour of sleep. With the

purpose (or purposelessness) of voluntary suffering thrown open by the massive social upheavals of the late nineteenth century, the “price” of truth became a subject of renewed concern. In an era of contractual exchange, the power of science to create value was a matter of continual negotiation.

While exploring these negotiations, I underscore the lasting influence of the nation’s histories of bondage and disenfranchisement, which gave conviction in “truth at any price” distinctive shape in the late nineteenth century. As I explain in chapter 3, for instance, the “pure scientists” who spearheaded the organization of American research universities defined their lives of toil, loneliness, and penury in ways that excluded the participation of others deemed less worthy of such lofty pursuits. The frozen noses and aching feet of the polar explorers discussed in chapter 4 were bound to histories of selfhood and personhood that endowed some bodies with powers of vulnerability largely denied to others. The few dozen X-ray experimenters described in chapter 5 were hailed as heroic martyrs to science, while the hundreds of laborers and animals subjected to equivalent amounts of X radiation were not. Even the fictional proponents of self-sacrifice considered in chapter 6 reproduce and promote these patterns of differentiation and exclusion. To consecrate oneself to science in the late nineteenth century required a certain kind of socially constituted self. Without this willful self, one could hardly indulge the odd privilege of voluntary suffering.

To restate, the aims of this study of self-sacrifice in American science are threefold: to demonstrate the centrality of self-possession in delimiting which selves could be apprehended as truly sacrificial, to elucidate the paradoxical character of the proprietorial self’s willful suffering, and to articulate the unsettled character of the reason for (and of) the scientist’s sacrificial exchange. Chapters 1 and 2 help frame these arguments: the first by offering a broader history of the voluntarily suffering self, the second by explaining the location of this self in the massive reorganization of scientific labor ongoing after the Civil War. Chapters 3 through 6 flesh out the operations of science, suffering, and selfhood in particular communities of practice. The book’s epilogue, “The Ends of Sacrifice,” considers the contemporary resonance of these painful histories.

When faced with a parent suffering from Alzheimer's, most of us respond with denial ("It won't happen to me") or extreme efforts at prevention. But global health expert and TED Fellow Alanna Shaikh sees it differently. Brian Cox explains how curiosity-driven science pays for itself, powering innovation and a profound appreciation of our existence.  
[https://www.ted.com/talks/brian\\_cox\\_why\\_we\\_need\\_the\\_explorers](https://www.ted.com/talks/brian_cox_why_we_need_the_explorers). Leo Igwe: Why I choose humanism over faith.