FURNISHING THE SKILL WHICH CAN SAVE THE CHILD: DIPHTHERIA, GERM THEORY, AND THEODICY

by Kristin Johnson

Abstract. Amid the diverse ways men and women have viewed the relationship between science and religion, explicit arguments that "Science is God's Provision" remain unexamined by historians. Such arguments are examined here as they relate to the problem of theodicy, by looking at a particular case study that inspired comments on the relationship between medicine and faith, namely, the discovery of the diphtheria antitoxin. This story highlights, first, the flexibility of the tradition of natural theology, and second, the important role the problem of theodicy has played in the history of the relationship between science and religion.

Keywords: cancer; diphtheria; medicine; natural evil; natural theology; theodicy

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Some time in 1926, Reverend Harold Speight (1887–1975), minister of King's Chapel in Boston, stood at the pulpit of the oldest Unitarian church in the United States and spoke on the relationship between science and religion. The topic had recently been in the news. William Jennings Bryan's fight against teaching evolution had culminated in the Scopes "monkey" trial the year before. In contrast to Bryan, Speight's views stood on the very liberal end of the spectrum of Christian belief. He did not believe, for example, in miraculous intervention. Rather, he spoke of how often he had heard people bitterly complain of unanswered prayer: "The desired aid did not arrive, the sickness was not stayed,—and then faith went, as a candle flickers and goes out if an outside door is open." But Speight urged that if men and women only understood that, at the moment of loss, it was not God who was absent, but the scientific knowledge required to control nature—that someone's ignorance "accounted for the disaster which prayer had failed to avert"—then not only could faith in God remain, but action

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would be "diverted as rapidly as possible to the purposes of science." Speight strongly believed, in other words, that scientific knowledge would permit men and women to alleviate suffering. And once men and women viewed God's providence as reflected in the highest use of the best knowledge for the good of all, rather than in answers to individual appeals, then "Thy will be done" could become a call to action rather than a prayer of resignation. "When we are now at the end of our tether in the crises of our need," he concluded, "when once prayer was all that a man had, we can turn to the doctor and surgeon and nurses to furnish the skill which will save the child." In doing so, Speight urged his parishioners to repudiate contemporary demands that one must choose between Science and God. Indeed, he outlined a path that he believed would allow men and women to maintain Faith by explicitly appealing to the potential triumphs of Science.

Speight's sermon represents one means of wrestling with the challenges posed by commitment to modern science as a means of improving life on Earth, amid earnest belief in God's activity and power. It is a challenge that confronts many individuals of faith at some point. The question sounds relatively abstract, but it must be met any time an individual who believes in both God's benevolence and the power of science prays at the side of a hospital bed. In this article, I examine a particular theodicy—"science as God's provision"—on the assumption that the role of theodicies in general warrants more attention as a factor in the history of the relationship between science and religion. In particular, tracing the influence of theodicy on how individuals have navigated the relationship between medicine and faith provides a fine example of how, as historian John Hedley Brooke writes, "models of nature designed to highlight divine activity have so readily lent themselves to reinterpretation in secular terms" and vice versa (Brooke 1989, 16).

This article first surveys a few early "science as God's provision" theodicies, and then tracks this kind of theodicy within reflections on a very specific instance of suffering, the infectious disease diphtheria. This disease once posed a consistent and deadly threat, especially before the triumphs of germ theory and public health allowed cancer, heart disease, and other so-called "diseases of affluence" to move up the list of mortal illnesses (at least in industrialized nations). The fact that diphtheria was one of the first infectious diseases physicians could actually cure at the bedside makes it a useful case study for examining uses of "science as God's provision" theodicies. I examine the appeal of such theodicies as attempts to wrestle with the experience of unmerited suffering, as justifications of doing science amid very specific challenges to the authority of scientific medicine, and as tools through which men and women who both believed in Christianity and valued science have attempted to reconcile apparent conflicts between the two.

Theodicy and Science: A Brief Survey

Although the term theodicy was coined by Gottfried Leibniz in 1710, attempts to explain suffering extend, of course, much farther back in time. Christians have posed a range of answers to the problem of suffering and evil. Some simply deny that humans can say for certain that any particular instance of pain or suffering is, in fact, evil, and that God must have some reason for permitting what we perceive as suffering. "Free will" or Augustinian theodicies hold that a creation in which free will exists is a greater good, but that free will comes at a price, namely that humans may act wrongly and produce evil and suffering for themselves or others. "Soul-making" or Irenaean theodicies hold that the world is designed in such a way as to allow human beings to undergo spiritual growth (a great good) that ultimately fits them for communion with God. Such growth cannot happen in a hedonistic paradise where no evil and suffering exist, but must take place in a world in which moral choices may be made (Tooley 2015).

One of the primary criticisms of both soul-making and free will theodicies is that, while they may explain *moral* evil, they do not adequately explain *natural* evil (predation and consequent animal suffering, earthquakes and tsunamis, hurricanes, plagues, and so on). Charles Darwin, for example, found theodicies that explained suffering as a means of moral improvement revolting, because, as he wrote in his *Autobiography*, "the number of men in the world is as nothing compared with that of all other sentient beings, and these often suffer greatly without any moral improvement." Natural law theodicies, the most important for our purposes, attempt to solve this problem of "natural evil" by posing some version of the following:

> We may, I think, without much difficulty, be brought to admit the four following points: first, that important advantages may accrue to the universe from the order of nature proceeding according to general laws: secondly, that general laws, however well set and constituted, often thwart and cross one another: thirdly, that from these thwartings and crossings, frequent particular inconveniencies will arise: and, fourthly, that it agrees with our observation to suppose, that some degree of these inconveniencies takes place in the works of nature. These points may be allowed; and it may also be asserted, that the general laws with which we are acquainted, are directed to beneficial ends. . . . Whilst we assent to the above-stated propositions as principles, whatever uncertainty we may find in the application, we lay a ground for believing, that cases of apparent evil, for which *we* can suggest no particular reason, are governed by reasons, which are more general, which lie deeper in the order of second causes, and which on that account, are removed to a greater distance from us. (Paley 1802, 527–28)

Natural law theodicy, or the solution to the problem of evil based on general rules, answers the problem of natural evil by emphasizing that it is inevitable that natural laws (in the main good) sometimes interact in a way

that produces evil and suffering. The close, complicated ties between the theodicy problem, Western science, and the tradition of natural theology are hinted at by the fact the above quote illustrating a natural law theodicy is drawn from William Paley's *Natural Theology; or, Evidence of the Existence and Attributes of the Deity*. By the time Paley composed that work, the entire paradigm within which anatomists and naturalists worked depended upon the assumption that in studying the "book of nature" one learned about the attributes of God. Paley argued, of course, that the purposeful design of animal form and behavior demonstrated God's goodness. Not surprisingly, the ties between the problem of theodicy and natural theology became most explicit when authors like Paley dealt with the existence of disease. In a concluding chapter entitled "The Goodness of the Deity," Paley acknowledged that pain, privation, and disease existed. But he asked the reader to consider whether evil, though it exists, was ever the *object* of contrivance. "Teeth are contrived to eat," he pointed out, "not to ache; their aching now and then is incidental to the contrivance." Paley urged, then, that pain and disease were never *designed*; all were incidental to things that were in the main good. In nature, "we never," he wrote, "discover a train of contrivance to bring about an evil purpose. No anatomist ever discovered a system of organization calculated to produce pain and disease; or, in explaining the parts of the human body, ever said, this is to irritate; this to inflame" (Paley 1802, 243). Indeed, disease could even be placed on the "good" rather than the "evil" side of the ledger once one took the broader view and recognized that, first, human sympathy grew amid bodily human suffering; second, disease reconciled mankind to inevitable mortality; and third, suffering and pain inspired greater appreciation for health when it was present.

A few years earlier, Reverend Thomas Malthus had argued that the existence of great misery and suffering, including disease, resulted in the very great good of the intellectual progress of man. Suffering (e.g., that produced by the natural law that population inevitably outstripped food supply) inspired the exertion required for the production of mind. Malthus thus argued that evil exists in the world "not to create despair, but activity." Indeed, he insisted that it was not only in the interest "but the duty" of each individual to "use his utmost efforts to remove evil from himself and from as large a circle as he can influence." The more wisely and successfully a man exercised this duty, the more he would improve and exalt his own mind, and in doing so more completely "fulfill the will of his Creator" (Malthus [1798] 2004, 158).

Both Paley and Malthus believed in a closely governing, personal God, while emphasizing that God's governance took place via natural laws that provided a trustworthy universe for mankind's efforts to understand His creation. For our purposes, the way natural theology—which had God personally designing the hinges of earwig's wings—eventually backfired

may be foreshadowed by a line in the "great agnostic" Robert Ingersoll's last public address, delivered before the American Free Religious Association: "If a good and infinitely powerful God governs this world . . . how can we account for cancers, for microbes, for diphtheria, and the thousand diseases that prey on infancy?" (Ingersoll [1899] 1944, 482). The tremendous misery and suffering captured by the word "cancers" in Ingersoll's demand requires no explanation for a modern reader. But it is worth pausing to allow witnesses to describe what Ingersoll could capture by using the word "diphtheria," since the disease has, today, been experienced by relatively few. A church elder who had witnessed the disease within his community wrote movingly of one victim that "no words can picture the horrible sight of little Ruth, as she lay in the grip of the foul destroyer. Her tongue was a mass of ulcers, and so swollen that it forced her mouth open. She lay in a stupor and nothing could be put in her mouth to remove the pus that was constantly forming in mouth and nostrils" (Peckham 1912). A physician described another case as follows:

> I recall the case of a beautiful girl of five or six years, the fourth child in a farmer's family to become the victim of diphtheria. She literally choked to death, remaining conscious till the last moment of life. Knowing the utter futility of the various methods which had been tried to get rid of the membrane in diphtheria or to combat the morbid condition, due, as we know now to the toxin, I felt as did every physician of that day, as if my hands were literally tied and I watched the death of that beautiful child feeling absolutely helpless to be of any assistance. (Anon. 1927b, 574)

For some readers, such dilemmas combined with Paley's inability to explain the appendix, male nipples, and the at times tragic malfunctioning of the epiglottis to create serious problems for natural theology (especially, of course, once Darwin offered an alternative, purely naturalistic explanation of purposeful parts). Still, the tradition of natural theology was impressively durable. As an argument that depended upon reason and observation in an age permeated by the values of the Enlightenment, it was standard reading among radical Unitarians as well as more orthodox Christians (James 1995, 31). As Brooke (1991) has described, natural theology was also very flexible, and therefore quite resilient in the face of both scientific change and diverse concepts of God.

The challenges posed by the tradition of natural theology and the problem of theodicy at its center were clearly important to how certain individuals responded to evolution. Indeed, the Irish playwright George Bernard Shaw attributed the triumph of Darwinism to individuals' rebellion against the fact that Paley's natural theology—which was based on a static view of creation—provided so unsatisfactory an answer to the problem of evil. Natural selection, Shaw (1921) explained, had at the very least provided "a method by which horrors having every appearance of being elaborately

planned by some intelligent contriver are only accidents without any moral significance at all." By contrast, some Christians found in evolution a new means of giving moral significance to the suffering witnessed in nature. Charles Lyell, a Unitarian, confessed privately to the appeal of evolution given the existence of natural evil. Indeed, he wondered whether evolution might finally resolve the great problems of theodicy because, if Darwin was correct, one must no longer believe in the doctrine of the direct agency of the Creator "as the immediate source of individuality." That doctrine, Lyell observed, had long labored "under the difficulty that abortion, inferior, diseased, immoral, stupid, insane creatures are not the result of laws but of special intervention" (Wilson 1970, 283). The Darwinian botanist Asa Gray also believed Darwin's theory could account for the imperfections and failures in nature that had troubled men and women for so long, since it turned those imperfections and failures "to practical account," and made the apparent waste "part and parcel of a great economical process" (Brooke, 1991). Most importantly, many found their belief in God's goodness vindicated by the appearance of progress in the evolutionary record; after all, evolution had culminated in mankind. One just had to take a long-term view. In other words, Darwin's theory could be a helpful resource to natural theology, not just secularism. Brooke notes: "There was a sense in which the problem of pain had been more difficult for Paley, since on a traditional creationism it was not clear why the world, in Hume's phrase, should be such a botched job. But if pain and suffering were bound up with the only way God could have made beings as complex, sensitive and responsive as men and women then at least it was not entirely incomprehensible. Without struggle and often painful competition: no evolution. No evolution: no humanity" (Brooke 1989, 18–19).

The possibility of distancing God from responsibility for natural evil via an evolutionary view of the past was apparent early on. In the final pages of the 1844 (anonymously published) *Vestiges of the Natural History of Creation,* Robert Chambers applied his "law of development" to the old question of how the omniscient, omnipotent, and benevolent God of Christianity could permit evil and suffering. "How, the sage has asked in every age," Chambers wrote, "should a Being so transcendently kind, have allowed of so large an admixture of evil in the condition of his creatures?" Chambers' reply to that question was as follows. The Deity operates according to fixed laws, including laws of development. Acting independently, such laws can only have effects that are *generally* beneficial, since often one law will interfere with another, and evil will be the inevitable, unplanned result. Chambers provided the example of an athletic boy suffering a fall that rendered him a cripple:

> Two things have been concerned in the case: first, the love of violent exercise, and second, the law of gravitation. Both of these things are good in the main.

> . . . But when it chances that the playful boy loses his hold (we shall say) of the branch of a tree, and has no solid support immediately below, the law of gravitation unrelentingly pulls him to the ground, and thus he is hurt. Now it was not the primary object of gravitation to injure boys; but gravitation could not but operate in the circumstances, its nature being to be universal and invariable. The evil is, therefore, only a casual exception from something in the main good. (Chambers 1844, 364–65)

Historian James Secord (2000, 341) notes that at least one reader, the British mathematician Thomas Archer Hirst, believed that Chambers's *Vestiges* provided a solution to the age-old puzzle of the fact that "the virtuous man is as liable to such misfortune as the wicked." Given Victorians' commitment to progress via science and technology, the subsequent passages may have been just as important: "The Great Ruler of Nature . . . has established laws for the operation of inanimate matter, which are quite unswerving, so that when we know them, we have only to act in a certain way with respect to them, in order to obtain all the benefits and avoid all the evils connected with them." Yes, in other words, great suffering existed, but in the unity of nature's laws the "First Cause" had benevolently provided the means of escape. Reason and science thus offered a path of redemption, and a redemption that occurred on earth rather than in heaven. Once, for example, man saw the human constitution as merely a complicated but regular process in electrochemistry, the path toward elimination of disease—"so prolific a cause of suffering to man"—became clear: to learn nature's laws, and to obey them. When, say, man discovered that rotting vegetation spread disease, "he is, as it were, commanded to take the right method in dealing with it" (Chambers 1844, 368, 370–71). Chambers insisted that the prodigious evils from disease were "not necessarily to be endured always. As civilization advances, reason acquires a greater ascendancy; the causes of the evils are seen and avoided; and disease shrinks into a comparatively narrow compass" (372–73). Chambers had to admit, of course, that mortality tables still showed a "prodigious mortality among the young" but he was confident that "to remedy this evil there is the sagacity of the human mind, and the sense to adopt any reformed plans which may be shewn to be necessary." A decade later John Snow's work establishing the source of an outbreak of cholera in London (and thus the means of ending it) surely vindicated such a promise.

The progressive and meliorist ethos that could be read into such natural law theodicies is clear: the obvious proper action in the face of such belief was to learn natural law and adjust one's behavior accordingly. In doing so, humanity could harness knowledge of natural law to alleviate and reduce suffering. Such a view united with other rebellions against theological doctrines like eternal damnation, beliefs that seemed so out of step with post-Enlightenment meliorism (Murphy 1955). In the twentieth century, Harold Speight implicitly relied on this kind of theodicy when

concluding that humanity could actually harness knowledge of natural law—via science—to control nature and in doing so ameliorate suffering. He, too, was in effect trying to solve the theodicy problem by, first, assuming the existence of inviolable natural laws and, second, highlighting the ability of human beings to discern those laws and adjust behavior and direct action in the face of that knowledge. In Speight's hands, then, science became the God-given route out of the evil and suffering with which theodicies had struggled for so long. Meanwhile this solution to the problem of evil not only reconciled science and (albeit a much-revised) Christianity, but also opened the possibility of a pious defense of why science should be valued and supported. The confidence with which Speight urged his parishioners to turn to the physician and the nurse is striking, however. And to make sense of that confidence, we need to examine the complex relationship between medicine and faith amid extraordinary scientific change, and then take up the treatment of diphtheria as an example.

Medicine and Divine Action

Well aware of the distance to which God could be relegated by explanation via natural law, yet cognizant of science's power, a broad spectrum of theologians—including William Paley—insisted that "explanation by 'natural law' was not incompatible with divine superintendence" (Livingstone and Noll 2000). Historian Charles D. Cashdollar (1978) has examined how even orthodox theologians fine-tuned discussion of providence by distinguishing between general providence (God's regular operation by natural law, or regular, predictable causes to be comprehended through natural science), miracles (the interruption of natural laws by direct, divine interference for the benefit of human faith), and special providence (a more inscrutable category somewhere in between general providence and miracles) (266–68, 272). Not surprisingly, it was often within the realm of disease and the role of medicine that such discussions took place. In the United States, the geologist and Congregationalist minister Edward Hitchcock, in delivering a sermon on the lessons taught by sickness in the late 1830s, said that while he "would not be thought to deny that sickness is always an act of God's Providence . . . in general, He exercises that Providence and that sovereignty, as he does in respect to almost everything else, according to fixed laws: so that when disease assails us, we may be sure that there is a natural cause for it." Furthermore, Hitchcock believed that until men understood that disease and health depends upon fixed and invariable laws, they would not study those laws in order to avoid disease and preserve health (Hitchcock 1842, 72–73). As Hitchcock wrote in *The Religion of Geology,* the means of health and comfort offered by the physician or surgeon "are, indeed, for the most part, of human invention, but not, therefore, the less indicative of divine intention; for they are founded

upon such a constitution in nature as makes it possible to discover remedies for disease and accidents" (Hitchcock 1851, 196).[1]

Similarly, at the opening of the twentieth century the orthodox Presbyterian theologian of Princeton University Benjamin Warfield allowed for direct intervention via miracles, while also viewing the provision of secondary causes (i.e., natural laws) as a proper realm for man's activity. Indeed he took "faith healers" who repudiated medical aid to task on the grounds that surely a God who demanded that man "work out your own salvation with fear and trembling" also required effort on the part of those who suffered in body. "It is the essence of fanaticism," Warfield warned, "to neglect the means which God has ordained for the production of effects" (Warfield 1918, 165–66).

Hitchcock, Speight, and Warfield, despite their doctrinal diversity, had this much in common: they maintained that medical efforts depended upon an understanding of the natural means God ordained for the production of effects. And they agreed those means could be determined only through the scientific study of cause and effect. The practical outcome of this belief for the purpose of disease prevention was captured nicely in a speech at the Vicksburg Sanitary Convention in 1889: "The all-wise God, our creator, has so arranged the workings of his great chemical laboratory that by the action of earth, water, air and sun the foul can be made clean, the apparently worthless made useful" (Scott 1890, 35). One simply had to establish the correct means of doing so, in this case, by ensuring—given the discovery that polluted water spread disease—that privies were not within close proximity to wells. Each also depended on a firm meliorist belief that humanity could—and should—improve its ability to treat and cure disease. Scientific medicine had been making promises for some time, going back to Francis Bacon's seventeenth-century vision of prolonging human life via experimental methods. When Clifton Hodge composed a defense of vivisection (which will become relevant below) in 1896, he promised a heavenly vision of what biology, physiology, and anatomy could one day do:

> In a word, the faith, hope, and charity which inspire this science are to learn enough about the laws and possibilities of living Nature, to do away with all disease and premature death, and to make all life as full and perfect as these laws will permit. This is the inspiration of biology. Is it base or unworthy? And it is not Utopian. It is possible. The end may not be attained for a hundred years or a thousand. That depends upon how much faith men have in it and upon how much effort they are willing to devote to it. But it will come as surely as the world moves. (Hodge 1896, 615)

Now, for most of the nineteenth century, evidence of progress and the ability to improve humanity's earthly lot lay primarily in technological marvels like steam engines rather than in medicine. By the latter half of

the century, medicine could call on things like antisepsis and anesthesia as evidence of progress, but little else (though both, of course, count for a great deal). The doctor's bag was mostly "a bag of blanks" (Porter 1998, 674). Historians speak of a tradition of "therapeutic nihilism" setting in as a result of doctors' inability to add to the list of armaments against disease, and of good bedside practice as sitting by with tonics and comfort, intervening only to help the body's *vis medicatrix naturae* do its work. When Hodge wrote the above manifesto, he had to concede that one half of people died before the age of forty, almost all of diseases that were surely curable or preventable "did we but know how." And this went on with a standing army of one hundred thousand physicians. "It looks discouraging," he conceded, "and an eminent physician has himself said that a doctor is like a man blindfolded, striking about with a club, almost as likely to hit his patient as the disease." The only hope amid such suffering, Hodge urged, was to learn more about "the principles upon which God had deemed it wise to order the living population of the world" (Hodge 1896, 618).

The Strangling Angel of Children

As evidence of why, amid reasons for courage and hope, science must not rest, Hodge cited the fact that nearly fifty thousand children died annually of diphtheria. Diphtheria was one of the top ten leading causes of death in the United States in 1850. The rest, with the possible exception of malnutrition-induced diarrhea, were all infectious diseases. And although William Paley did not have to deal with diphtheria (it had not yet appeared in the record books of physicians), everything else on the list posed a quite damning challenge to the "best of all possible worlds" view of the natural theologians. Meanwhile, no one could confidently claim that science had improved the physician's ability to cure much at all. What the individual parent must suffer in the meantime is hard to imagine. Take, for example, any central character in the story of Darwin's life and work. The biologist Thomas Henry Huxley, also known as "Darwin's bulldog" for his aggressive campaign for the theory of evolution, had to write the following postscript in his journal in 1860, below the December 25th 1857 entry marking the birth of his son:

> And the same child, our Noel, our first-born, after being for nearly four years our delight and our joy, was carried off by scarlet fever in forty-eight hours. This day week he and I had a great romp together. On Friday his restless head, with its bright blue eyes and tangled golden hair, tossed all day upon his pillow. On Saturday night the fifteenth, I carried him here into my study, and laid his cold still body here where I write. (Huxley 1913, 163)

Alfred Russel Wallace lost a son, Herbert, when the boy was six to scarlet fever. Georges Romanes, as he wavered between agnosticism and Christianity, was struggling with the death, following a delirious fever, of

a beloved sister. Joseph Dalton Hooker lost his little girl Maria at the age of six to "some obstruction of the bowels." Charles and Emma Darwin lost three-week-old infant Mary Eleanor in 1842, ten-year-old daughter Annie in 1851, and eighteen-month-old Charles in 1858. Philosopher George Henry Lewes held his son, Thornton, in his arms as the boy died a painful death from spinal tuberculosis. Critic of Darwin's theory Louis Pasteur lost two daughters to typhoid fever. Looking forward in time to the rise of "social Darwinism," John D. Rockefeller lost a daughter, Alice, at thirteen months. Mary Harriman, a philanthropist who bankrolled the Eugenics Records Office, lost a boy at the age of five to diphtheria, as did philanthropist of public health Elizabeth Milbank Anderson.

None of this is, of course, surprising to anyone familiar with medicine in the nineteenth century (when, in the 1880s, one-fifth of all infants in New York City died before the age of one, and those who lived still had a one in four chance of dying before they were thirty (Tomes 1998, 25)). But once we set aside the comforting fairy tale that parents in this period did not suffer much because they avoided becoming attached to their children, and truly let the level of human anguish sink in, the gauntlet offered by infectious disease to any simplistic rendering of nature as evidence of God's goodness is evident.

What were the options for faith within this world and how did they adjust as medicine changed? Diphtheria is just one of various potential case studies, from the terrible list of diseases with which parents were familiar, through which to examine this question. But it is particularly useful because, as historian Evelynn Hammonds notes, diphtheria was "the first infectious disease to be controlled by advances in scientific medicine, particularly discoveries in bacteriology and immunology" (Hammonds 2002, 6–7). Widely perceived as a triumph of scientific medicine and bacteriological research, the history of diphtheria treatment provides a useful place to examine both alternative visions of the relationship between medical progress and religious faith, and the role "science as God's provision" theodicies sometimes played in reconciling the two.

Diphtheria was a malady that struck fear into parents and physicians. It was described at the time as "one of the most dreaded, one of the most fatal, and, unfortunately, one of the most common maladies of childhood" (Smith 1890, 356), and was known as the "strangling angel of children" due to the sometimes wing-shaped white membrane that built up in the throat, sometimes suffocating the patient to death. The deadly cases in which the membrane grew into the nose, esophagus, or larynx were described by one physician as baffling "the best-directed efforts of the practitioner" (Greenhow 1860, 169). In a time in which physicians' primary tool was the confidence-building art of accurate prognosis, "malignant" diphtheria terrified the very best doctors: "on the one hand, very unpromising cases sometimes do well; on the other, patients whose

symptoms have not been particularly alarming to the unskilled observer, very often die" (Greenhow 1860, 212). Thus, doctors could not even deliver prognoses for the disease, much less cure it.

Meanwhile, the disease struck terror into communities. Diphtheria spared no class, striking the households of the highest and the lowest. Charles Darwin wrote soon after the first outbreak in England: "Poor dear Etty has been very seriously ill with Dipterithes (or some such name) . . . It has been a most suffering illness, with dreadful inflammation of whole throat." A postscript after the doctor, who had "damped us yesterday much" but now "gives very good Report" noted: "For Dipterithes it was a mild attack; there was no actual choking, but immense discharge & much pain & inability to speak or swallow & very weak & rapid pulse, with a fearful tongue" (Darwin 1858). When, in the spring of 1878, disease threatened yet again to rob Thomas and Henrietta Huxley of their children, it was an outbreak of diphtheria. Huxley recounted how "two of the cases were light, but my Madge suffered terribly, and for some ten days we were in sickening anxiety about her." She temporarily lost use of her sight, speech, and legs, and her throat was in agony, gasping and feverish, while "the family doctor stood by helpless" (Desmond 1997, 495). His friend Jeffery Parker described the impact on the famously stoic Huxley: "I never saw a man more crushed than he was during the dangerous illness of one of his daughters, and he told me that, having then to make an after-dinner speech, he broke down for the first time in his life, and for one painful moment forgot where he was and what he had to say" (Parker 1896, 166).

Yet just eighteen years after four-year-old Noel's death, now Huxley could *act*, and act with confidence. In that relatively brief space of time, the work of Louis Pasteur and Robert Koch had secured a robust hearing for the germ theory of disease (theories of contagion and infection had been around for centuries, but precisely *what* moved around and how to stop it was hotly debated). Huxley was one of the first to adopt the new theory, sending vials of "bacilli" back and forth to his friend, the physicist John Tyndall (Desmond 1997, 393). As word of Pasteur and Koch's work spread, men and women wondered: was this why Joseph Lister's antiseptic worked so well? Was it killing minute germs that caused all these terrible contagious diseases? (Elliott 1870, 488). Were the culprits of John Snow's demonstration that water spread cholera in fact microscopic "germs"? As scientists debated germ theory throughout the 1870s and 1880s, the fact it mapped on well to existing ideas about sanitation heightened imperatives of prevention and cleanliness (Tomes 1998). Huxley set to work organizing an enquiry to establish the source of the diphtheria outbreak in his neighborhood. He began the first public meeting by insisting that, although "the misery and suffering which had occurred was not traceable to any visible agency . . . there was no doubt that the course of the disease was perfectly definite and traceable, and quite capable of prevention if proper sanitary

precautions were taken" (Anon. 1878, 555). Huxley's enquiry eventually (erroneously) attributed the London outbreak to the "culpable negligence" of those who had installed a small drain pipe (Newsholme 1935, 189); the appropriate means of preventing future suffering, of course, was to simply fix the pipe. Though the agnostic Huxley certainly would not have done so, his good friend Robert Chambers might have added this as fine evidence of his grand theodicy at the conclusion of *Vestiges.*

But despite the progress on prevention, once diphtheria had lodged itself in the throat, or, indeed, once any other infectious disease appeared, there was no agreed-upon treatment, much less a consistently successful one. In the worst cases, in which the membrane threatened to suffocate the patient, cauterization seemed only to open up new areas to infection (physicians knew the membrane incorporated itself into the mucous layer, and thus could not be removed without the rupture of small blood-vessels in the mucous membrane, and in any case it just formed anew within a few hours). Alcohol, bichloride mercury, steam, boracic acid, chloral hydrate, very diluted solutions of hydrochloric acid, and various patent medicines were all on the list of doctors' tools to fight the disease in the 1890s (Mitchell 1897, 111). The State Quarantine physician of El Paso, Texas said of diphtheria: "the bad cases die and the mild ones get well without treatment," although "whisky in large doses is very beneficial" (Bush 1896, 1017).

Surgery (intubation or tracheotomy) was the primary option in the case of laryngeal stenosis (closing of the airway), and although many patients died from subsequent infection or cardiac paralysis (Newsholme 1935, 188), one physician noted that "the relief it gives is great, and even though your patient ultimately dies of heart failure, you have prevented the horrors of death from suffocation" (Bush 1896, 1017). One surgeon, faced with a seemingly hopeless case, performed a tracheotomy with the mother's words, "for the love of God, try to save my boy!" ringing in his ears. That surgeon provided statistics for the fifty operations he had performed: cured nineteen; deaths thirty-one (Buchanan 1880, 555). Face to face with a child suffocating before their very eyes, some physicians suctioned the tracheotomy tube with their own mouth to remove any secretions blocking the airway, knowingly exposing themselves to the disease in a desperate attempt to snatch the child from death. One commentator wrote following the death of a promising young physician: "The tracheotomy tube seems to be an ill-fated contrivance in encouraging physicians to jeopardize life to save life" (Anon. 1884–1885, 87).

Such acts, which became legendary, are emblematic of the desperation inspired by the disease. One doctor later recalled that "the physician's inability to cope with this scourge was one of the most devastating experiences through which a medical man could go" (Anon. 1927b, 574). It was also, surely, one of the most devastating experiences for the devout Christian

parent, surrounded by nineteenth-century promises of both God's goodness and the progress of science. It was supposedly a case of diphtheria that set Mark Twain to thinking of the tale of *Little Bessie,* in which a precocious little girl responded to her mother's insistence that God sent sickness to discipline sinful humans with the reply: "It's awful cruel, mamma! And silly!"

The Blessed Antitoxin

Rev. Harold Speight's vision of science confronting faith at the bedside of a dying child demanded more than that the physician know how to prevent disease; it demanded an increasing ability to cure. One must not know the cause only to move the pile of refuse, but to seize control of the illness and intervene. This is crucial to our story. For most of the list of deadly infectious maladies, treatment had to await the antibiotic revolution of the 1940s. Diphtheria, however, proved one of the earliest vindications of longstanding promises that scientific medicine and research could indeed furnish the skill which could save the child.

The discovery of the causative agent of diphtheria occurred amid the wave of identifications of bacteria following Louis Pasteur and Robert Koch's development of an experimental method by which to identify the bacterial origin of disease. In 1883, Edwin Klebs identified the diphtheria bacillus, and a year later Friedrich Loeffler proved it caused the disease. This meant cases of diphtheria could be confirmed by the presence of the bacteria (ultimately allowing physicians to differentiate it from croup), a practice taken up in earnest a decade later (Newsholme 1935, 190). The French bacteriologist Emile Roux eventually proved that one could remove the germs yet still create the disease, demonstrating that a toxin caused the terrible symptoms and explaining why, although the germs existed only in the nose or throat, other organs were affected.

Meanwhile, the discovery that exposure to diphtheria toxins conferred subsequent immunity led to hopes that scientists might harness the body's immune system to produce so-called antitoxins. Eventually, in 1901, Emil von Behring would receive the first Nobel Prize in Medicine for his work on serum therapy, especially diphtheria antitoxin. The prize citation announced that von Behring had "placed in the hands of the physician a victorious weapon against illness and deaths" (Nobel website). The first use of "antitoxins" in humans was in 1891 in Berlin, with more widespread use by 1894. As of 1897, the American Paediatric Society was recommending the use of antitoxin (usually manufactured by exposing horses and then harvesting the blood serum, Fig. 1) in diphtheria cases. After describing how, in 1,256 laryngeal cases, half recovered without operation, a proponent of antitoxin wrote:

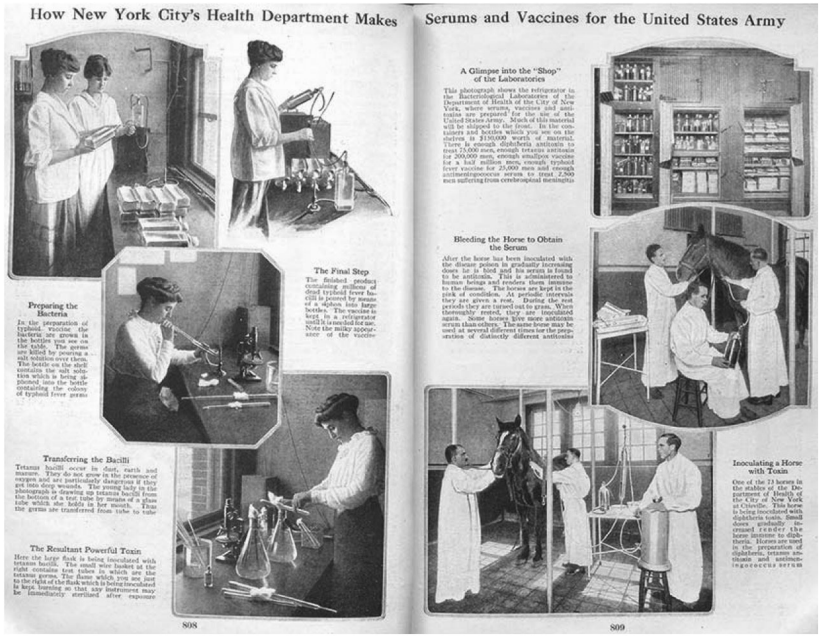

Figure 1. Diphtheria antitoxin was produced by exposing horses to the bacteria and then harnessing the antitoxin produced by their immune systems from a blood vessel in their neck.

> To him who still feels distrust, who avers that statistics bring no conviction, that strong men are on either side, I would say: when he has seen one severe case of diphtheria clear up like darkness into daylight, he will look for no more argument. Since the days when Lister proposed antiseptics in surgery, medicine has not taken so great a step in advance. (Shaw 1896, 475)

"My dread of diphtheria has decreased to such proportion," wrote another physician, "as to render me very much less worried when called to see a case" (Cheatham 1899, 216). Soon the claim that it was criminal not to treat a case of early-stage diphtheria with antitoxin appeared in physicians' journals. One physician even reported that the main challenge in using the antitoxin was that it cleared up cases so rapidly that some parents asked to pay $5 a dose suspected that it had not been a case of diphtheria at all! (Markel 1894, 63).

The effect of the addition of antitoxin to the physician's arsenal against disease is difficult to overestimate (Fig. 2). The physician who described the hopelessness of preantitoxin days (above) also wrote of the treatment of his own little girl with antitoxin 10 years after that terrible case: "To watch the choking dreadful membrane melt away within a few days, was one of the most dramatic and thrilling experiences of my professional career" (Anon.

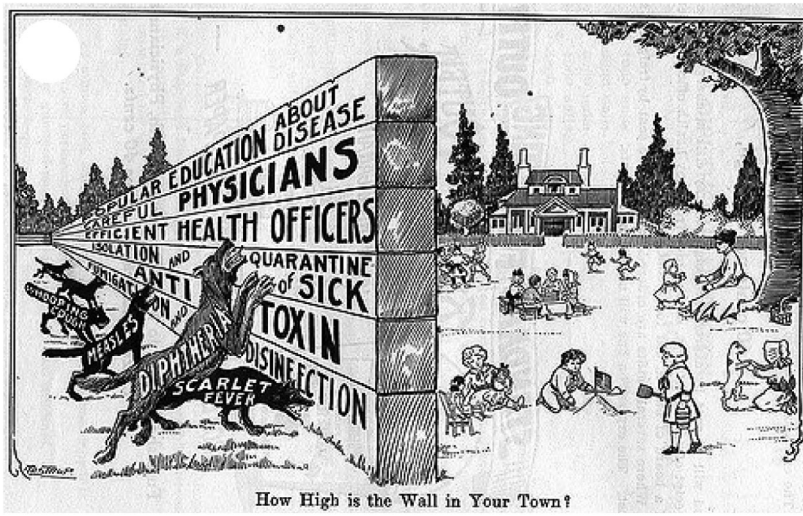

Figure 2. From "Scarlet Fever, Diphtheria, and Disinfection," *Virginia Health Bulletin* 1(1908): 216.

1927b, 573–74). Meanwhile, the seeming miracles that modern science, combined with human determination, could accomplish made headlines in 1925 when dogsled teams delivered antitoxin to a diphtheria outbreak in Nome, Alaska, a feat commemorated each year in the Iditarod trail sled dog race.

By 1900, diphtheria had dropped to the bottom of the list of top 10 causes of death (meanwhile, cancer appeared on the list as number eight, while "normal aging" also newly appeared at number nine). Contemporary accounts put the diphtheria mortality rate in London in laryngeal cases before antitoxin at 62%; after antitoxin it was recorded as 11.7% (Wainwright 1907, 198). This seemed a triumph of modern science indeed, a delivery on promises made since the seventeenth century that experimental methods would one day extend human life. For the first time, wrote a British public health expert, physicians could wrest control of diphtheria via science, rather than just prevent it (Newsholme 1935, 198). From the perspective of proponents of antitoxin, "pure" scientific research had finally delivered therapeutic measures. As one widely reprinted article announced: "Antitoxin is a child of pure science, and is born of logic" (Johns 1897, 8; a misprint in one journal replaced *logic* with *magic*!). The famous physician and pathologist William Welch wrote that "the discovery of the healing serum is entirely the result of laboratory work. It is an outcome of the studies of immunity. In no sense was the discovery an accidental one. Every step leading to it can be traced, and every step was taken with a definite purpose and to solve a definite problem" (Wilkinson 1895, 221). Combined

with the sanitary measures of public health, antitoxin was soon viewed as central to the "great mortality transition" in which infectious diseases slowly dropped down the list of top ten killers. The precise causes and nature of the transition are now, of course, the subject of much debate (see Tomes 1998, 15–16), but what is important for our story is the fact that, at the time, many saw the decreasing mortality rates as (finally) a vindication of all those promises that through understanding, obeying, and controlling natural laws via science, suffering could be alleviated.

What options were available for Christians in the face of such a development? As the influential orthodox theologians Hitchcock and Warfield's work shows, a robust tradition within Christian theology held that Christian doctrine and scientific medicine could be complementary rather than in conflict. Even groups that denied other triumphs of science, like Darwinian theory, reconciled the use of scientific medicine with Christian belief. A Seventh Day Adventist physician recalling debates over whether it was Godly to use medicines decided that, in the case of antitoxin, "until I get more light than I have now, I must consider it just as natural to go to the horse for antitoxin if the child is short on its own account, as it is to go to the cow for milk when the child's mother is short in this respect" (Sparks 1999).

Perhaps not surprisingly, given this strong tradition of reconciling Christian faith and medicine, it was in dealing with those who tried to place modern medicine *in conflict* with Christian beliefs and values that "science as God's provision" appeared most explicitly. Since 1894, the organization Faith Healers of Zion had been calling upon readers to trust God rather than physicians in their journal *Leaves of Healing* (Fig. 3). Eventually tales of children dying after being given antitoxin appeared in the journal's pages (proponents of scientific medicine replied that the antitoxin had simply been given too late, but "serum-sickness"—the result of using unpurified horse sera—and a lack of needle sterilization were also culprits). An account in the 1920s of a father's reasons for declining antitoxin captured the obedience—in a country enamored of scientific medicine—demanded of a parent who believed physical suffering was caused by sin, rather than germs: "I have implicit faith in God. If it is His will, they must die" (Anon. 1927a). In a piece titled "Put This before Your Clientele," F. E. McCann suggested that physicians respond to such arguments by pointing out that God had not only placed the drugs that belonged to the "animal, vegetable or mineral kingdom" on earth, but had "endowed man with a mind to find out about things put here for his welfare" (McCann 1916, 445). To parents who had chosen prayer rather than antitoxin, one doctor replied: "We do not question the power of Divine assistance, but it is our duty to make use of the material means that God furnishes us to alleviate human sufferings" (Anon. 1910, 6). And in responding to the opposition of Christian Scientists to medical science, Dr. Henry Reed Hopkins urged that the remarkable advance of the science of medicine must, in fact, "to

Figure 3. Faith healing relied upon the assumption that physicians only patched up symptoms; true medicine constituted an attack on the cause of disease, namely sin. This cartoon is from the Faith Healers of Zion's *Leaves of Healing*.

every lover of his fellow-men, the innumerable host of sufferers," be seen as "an occasion for hearty thankfulness to Almighty God, the Giver of all good" (Hopkins 1900, 231).

Another place where "science as God's provision" theodicy appears is in responses to those who opposed the particular means through which antitoxins were discovered and produced, namely vivisection. Dosages were established using rabbits and guinea pigs, and the use of horses in the production of antitoxin was well known. These practices proved ready targets of the antivivisection movement, which had been growing since the 1860s amid the rise of physiology and animal experimentation (Buettinger 1997, 858). American critics of the movement pointed out that "scarcely a paper appears against the practice of vivisection which does not contain solemn appeals to the Deity. These are too sincere to be ignored." The American Antivivisection Society composed a resolution, for example, that experiments on live animals opposed the intent of a beneficent, merciful Creator, "who wills the happiness of all his creatures" (Hodge 1896, 617).

In the late 1890s, when the Clark University physiologist Clifton F. Hodge replied to antivivisectionists' appeal to the will of the Creator, his strategy was to remind readers of the enormity of the suffering in the natural world. Think, he wrote, of the "teeth and jaws, the beaks and talons, the

claws and fangs" developed for the purpose of preying on the weak, of parasitic animals and plants that sucked the life blood of their hosts, of the many diseases caused by microbes, resulting in "slow, loathsome decay, convulsive torture, or the burning to death of fever," all going on for a time that baffled the imagination. And yet all this competition and suffering had resulted in the progressive evolution of man: That "the price has been great," Hodge conceded, "but the gain is priceless; and we would not give back, if we could, all the suffering the world has felt and revert to vegetation and formless slimes." Biology had gained the "divine point of view," in being able to see that out of the struggle came the development of a nobler form and higher life; predation, suffering, and disease maintained the balance of nature, which was, of course, a great good. This, Hodge urged, "is the plan of an all-merciful Creator, and man has never been able to suggest an improvement upon it, within the limits of physical conditions" (Hodge 1896, 620).

In the face of such misery, violence, and suffering, one answer, of course had always been resignation in the face of a deep ignorance of God's ultimate plan. But Hodge, like Reverend Speight, asked instead: "Taking Nature as we find it, what can man do about it?" Directly opposed to resignation to fate, he wrote, "is the spirit of modern science, which considers it man's duty to go to work and manufacture fate." Surely one had no right to assume the forces of Nature were difficult to control until all the laws had been discovered and investigated. "Numberless instances in the history of science," he urged, "prove that his powerlessness is a mere bugbear of man's own imagining. It may be so in all cases. If man will only put forth a reasonable amount of effort, it may not be so difficult to comply with the command, 'Subdue the earth'." And then, in a passage that would have done Malthus proud, Hodge wrote:

> All the suffering and physical evil in living Nature find ample justification for its existence if, serving as a spur to man, it arouses him to use his intelligence and put forth every energy available to alleviate the misery of the world and improve its condition. In other words, Nature is *wisely* ordered to give *man plenty to do,* and to do this work is one of his highest duties. (Hodge 1896, 624)

As an argument against antivivisection, Hodge's emphasis on the terrible suffering evident in any clear-eyed observation of the natural world held that "by this very dispensation of Nature God clearly gives to man every sanction to cause any amount of physical pain which he may find expedient to unravel his laws" (Hodge 1896, 620). But one of the arguments of antivivisectionists was that experiments on animals had not, despite all promises of utility, led to any life-saving medical knowledge (Buettinger 1997, 862). Recall that Hodge had cited the more than 40,000 children dying each year from diphtheria as evidence of how much work was to be

done. And he wrote in 1896, just prior to any organization recommending antitoxin. This is important because at the time antivivisectionists could still counter Hodge by pointing out that nothing had, in fact, been delivered amid all these grand promises that suffering was necessary for some divinely sanctioned progress.

Yet eighteen years later, in a lengthy treatise entitled *Animal Experimentation and Medical Progress,* the brain surgeon William Williams Keen could argue against antivivisectionists by, first, citing the progress in curing diphtheria, and second, explicitly attributing that progress to God's providence via science. He first recounted the pitiful story told by one of his colleagues of standing with a young mother by the bedside of her only child:

> The child, in the throes of diphtheria, was clutching at its throat and gasping vainly for breath. Suddenly the mother flung herself on the floor at the doctor's feet in an agony of tears, entreating him to save her child. But alas! it was impossible.

If only the case had occurred just a few years later, Keen wrote, "when the blessed antitoxin for diphtheria had been discovered (solely by animal experimentation), this remedy would have been given early; and almost certainly within a few hours the membrane would have softened and disappeared, and that life, precious beyond rubies, might have been saved" (Keen 1914, 231). Whereas in the dreadful days before antitoxin the only comfort physicians could give distracted mothers was that "it was God's will," "now, thank God, it is not His will." A table of mortality before and after the use of antitoxin concluded the argument. In the face of these data it was surely, Keen insisted, "a Christian duty to promote experimental research" (Keen 1914, 233). This was not opportunistic rhetoric: Keen was a practicing Baptist who also wrote *I Believe in God and in Evolution* (1922) (in which he used the insights provided by experimentation on animals in the treatment of epilepsy and diabetes, as evidence of humanity's common ancestry with other animals). As for those who opposed research on animals, he was confident of one thing:

> Had they ever stood as in the past I have stood, knife in hand, by the bedside of a gasping, livid child struggling for breath, ready to do a tracheotomy when the surely tightening grip of diphtheria made it necessary to interfere, they would hail with delight the blessed antitoxin which has abolished the knife and enormously diminished the mortality of that curse of childhood. They would surely bless God that such a discovery as this antitoxin could be made *solely by experiments on animals.* (Keen 1914, 285)

Adding to the above use of "science as God's provision" as an argument against science's critics, Reverend Speight's fellow Unitarians, traditionally great allies of science, also cited the ability to fight diphtheria and other infectious disease as the culmination of longstanding promises that God had provided humanity with the means to meliorate conditions in the

here and now, rather than wait for heaven in the hereafter. The victories over the horrors of cholera, smallpox, yellow fever, and diphtheria, wrote one Unitarian author, "give sure prophecy of sweeping triumphs to come," triumphs attributable to human will under the (albeit somewhat distant) guidance of God's grace: "We see at last what he (Christ) wanted to do—and now we propose to do it" (Holmes 1913–1914, 17, 20). A contributor to the leading Unitarian weekly conceded "there are many evils in the world," but he insisted that the evils being rooted out was inspiring beyond anything that the world had ever known:

> Fifty years ago we were greatly disappointed in the results of scientific discovery. We fondly hoped that steam, electricity, and allied inventions were at once to drive away poverty, disease, ignorance, and most of the other ills that human flesh is heir to. We forgot that in His sight a thousand years are but as one day. Now, however, we are coming into our inheritance [sic]. Diseases which have made vast tracts of territory uninhabitable and others which have ravaged every civilized community are now met by skillful physicians who can speedily produce the antidote, for instance, of such diseases as diphtheria and cerebro-spinal meningitis; while prevention by rational means now makes such diseases as malaria, yellow fever, and tuberculosis signs of ignorance and incapacity, and not tokens either of divine wrath or of nature's secret and implacable hostility. (Anon. 1909, 114)

By the 1920s, stories were told of children's lives snatched from death by a physician appearing at the bedside with his syringe of miracles. In his survey of the rise of preventative medicine, the physician and bacteriologist Konrad Birkhaug noted that one could now attribute the fact that diphtheria was still third place among the communicable diseases to the negligence of physicians, public health authorities, educators, and lawmakers, rather than the inscrutable plan of God (Birkhaug 1928, 220). Indeed, while surveying the "March of Preventative Medicine," Birkhaug included a poem by the British scientist W. C. D. Whetham that linked all the trials and successes of the heroes of his story together as "weaving the purpose of God" (Birkhaug 1929, 161). Reverend Harold Speight would surely have delivered a fervent "amen."

Conclusions

Thanks in no small measure to the diphtheria antitoxin, by the time Reverend Speight gave his first sermon at Kings Chapel in 1923, it was easier to see medicine as delivering on the deep meliorist faith in both the ability and the obligation of humans to improve humanity's lot on earth. Some of those sitting in the pews before him may even have witnessed a doctor "furnish the skill which will save the child" by administering diphtheria antitoxin to their own children. The recent war had delivered a seemingly damning blow to visions of progress via science, of course, but many viewed American participation in "the war to end all wars" as part of that

upward process. The 1920s were, after all, the heyday of "progressivism" in American political life, represented by a firm commitment to the belief that scientific management by experts would establish the new millennium on earth by telling men and women who to marry, what to eat and drink, and how to clean their homes. And while prohibition and eugenics may sound archaic and misguided to a twenty-first-century reader, the meliorist assumption that science provides the means of progress surely is familiar, whether that reader be critic or crusader.

Since the introduction of the diphtheria-tetanus-pertussis (DTP) vaccine in 1949, the number of diphtheria cases has plummeted. Today diphtheria is virtually unknown in the "developed" world. The last outbreak in the United States was in Seattle in the 1970s. From 206,000 cases reported (and 15,520 deaths) in 1921 in the United States, only five cases have been reported to the Centers for Disease Control in the last decade. (Worldwide, more than 7,000 cases were reported in 2014 to the World Health Organization, a clear example of how successful amelioration of infectious disease depends on social justice as well as bacteriology.) For those intent on seeing God's benevolence within the progress humanity made—and would continue to make—against suffering and disease, progress on diphtheria was vindication indeed.

Meanwhile, within the wake of the antibiotic revolution of the 1940s and 1950s, the "great mortality shift" took shape. Other infectious diseases, with the exception of influenza and pneumonia, eventually disappeared from the list of big killers. An individual in the United States wrestling with the problem of theodicy no longer has to deal with diphtheria as an example of unmerited natural evil. The possibility that one's child might be strangled to death by diphtheria toxins accumulating in the throat no longer poses a challenge to natural theologians' insistence that nature shows us God is all-powerful, wise, and good. (Of course, William Paley may have pointed out that the fact the antitoxin was not formed *with the purpose* of strangling children meant it never undermined the design argument in the first place.)

But the image of Speight's parishioner, losing his or her faith at the bedside of a dying child, captures a dilemma that continues to confront belief in a benevolent God in a scientific age. Over the course of the twentieth century, and partly as a result of progress on infectious diseases, so-called "diseases of affluence," including cancer, moved up the list. And cancer is a different beast: a population of cells which grows via a process of natural selection, in which the malignant cells will stop at nothing, even at the expense of the death of healthy cells, and, ultimately, the organism's death. Paley's insistence that no evil is "contrived" simply does not work as well, a problem recognized more than a hundred years ago by the "great agnostic" Robert Ingersoll. He cited the "marvelous mechanism" by which cancer is supplied with "long and slender roots that reach out to the most

secret nerves of pain for sustenance and life" to mock the belief that a benevolent "God of Love" could be seen in the intricate design in Nature, whether that design occurred through a process of evolution or by direct special creation (Ingersoll 1873, 24).

A potential answer to Ingersoll appeared in a recent contribution to *Zygon* entitled "Chance, Necessity, Love: An Evolutionary Theology of Cancer." There, authors Leonard Hummel and Gayle Woloschak (2016) addressed the question: where is "love, divine and human, within the evolutionary chance and necessity operative in all dimensions of cancer?" In wrestling with the problem of cancer and God's love, the authors synthesize the views of Jacques Monod, Arthur Peacocke, and Charles Sanders Peirce to argue that "the work of scientific communities of inquiry to understand and to find better ways to cope with the disease of cancer is itself the work of divine love."

Like Speight's effort to uphold faith in a benevolent God despite events like the death of a child, Hummel and Woloschak depend upon an implicit theodicy, one that draws on natural law to make sense of the existence of cancer, and then concludes with a message that our ability to do science and better understand cancer for therapeutic purposes is evidence of God's love amid great suffering. Hummel and Woloschak draw upon the theodicy of Arthur Peacocke, who held that "*God suffers in, with and under the creative process of the world* with . . . costly, open-ended unfolding in time." That costly creative process is evolution, with all its associated phenomena of "natural evils," namely competition, struggle, suffering, and death. Peacocke argued—he himself suffered from cancer—he that he had tried to show in his writings "that what we call natural evil is a consequence of a divinely created law-like structure implementing the divine purpose to bring into existence intelligent persons" (quoted in Hummel and Woloschak 2016, 306). Hummel and Woloschak place the phenomenon of cancer within the context of Peacocke's theology by noting that the same creative processes that allowed humans to evolve, namely genetic mutation and natural selection, also, and inevitably, are responsible for cancer. They then draw on the pragmatist philosopher Charles Sanders Peirce's belief in the transformative power of "the human capacity to imagine and sometimes create better conditions in the world" in order to argue that, to the degree that research "may bring about better understandings of the disease that, in turn, may lead to better treatment for those suffering from it, to that degree such attempts may be received as the work of divine love in the world" (Hummel and Woloschak 2016, 313). Hummel and Woloschak's theodicy thus implicitly constitutes an argument against the idea that the existence of cancer undermines faith in a benevolent, loving God.

Eloquent rebellions from such theodicies have existed and exist, of course. Even as diphtheria (or membranous croup) rates dropped, playwright George Bernard Shaw seemed to mock the kind of theodicies

examined here when he wrote: "The theology of women who told us that they became atheists when they sat by the cradles of their children and saw them strangled by the hand of God is succeeded by the theology of Blanco Posnet,[2] with his 'It was early days when He made the croup, I guess. It was the best He could think of then; but when it turned out wrong on His hands He made you and me to fight the croup for Him'" (Shaw 1921, l–li). When asked during an interview what he would say if "it all turned out to be true" and at his death he walked up to the pearly gates and was confronted by God, the British actor and atheist Stephen Fry unhesitatingly replied:

> Bone cancer in children? What's that about? How dare you! How dare you create a world that has such misery that is not our fault. It is not right. It is utterly, utterly evil. Why should I respect a capricious, mean-minded, stupid God who creates a world that is full of injustice and pain?

In the resulting furor inspired by his remarks, Fry pointed out that he was simply asking a question—the basic impetus of any theodicy—that had been asked for thousands of years. But both Fry's rebellion and the "science as God's provision" theodicies examined here reflect very specific historical contexts characterized by both the rise of modern science and the meliorist ethos with which that rise is deeply intertwined. While some find any theodicy—natural law or no—repugnant, others have found in "science as God's provision" theodicies a productive means of supporting science, defending God, and reconciling meliorist demands for human action with the demands of obedience and faith.

Ironically, the triumphs of modern science since the nineteenth century have in some ways heightened the dilemmas posed by disease and suffering for individuals of faith. Modern scientific medicine is, of course, permeated by mechanistic analogies—a vision of nature as comprehensible once one imagines it as a machine that can be understood through studying its material parts. As historians have demonstrated, the mechanical philosophy at the root of such analogies ultimately, and ironically given the Christian beliefs of its founders, only heightened the problem of evil: Why, if so beautifully designed, did the "machine" sometimes break in such terrible, terrible ways? Of course, the basic assumption of modern medicine is that, if the human body is analogous to a machine, it can be fixed when broken, though this is, of course, small comfort when it *isn't* fixed.

"Modernist" Christians like Harold Speight appealed to visions of our increasing ability to "fix the machine" and evolutionary and social progress as rooted in the governance of God, and thus—like Hummel and Woloschak—recovered a message of God's love and benevolence so long as one focused on the long-term progress of humanity rather than instances of individual suffering. They thus moved the target of God's benevolence

from the individual to humanity as a whole, and looked for evidence of that benevolence in the progress of science.

This would be a long-term vision against which William Jennings Bryan—the most famous member of the prosecution at the 1925 trial of John T. Scopes for teaching evolution—famously rebelled, for where in this vision, he demanded, lay the extraordinary power of faith to transform the individual, much less the power of petitionary prayer? Ironically perhaps, Bryan's rebellion echoes those of George Bernard Shaw and Stephen Fry: each constitutes an ethical rebellion against various theodicies in which the individual seems to have been abandoned, whether for the sake of the "progress of humanity" or by God.

In her book *Preaching Eugenics: Religious Leaders and the American Eugenics Movement*, historian Christine Rosen has noted how in the eugenics movement "Americans achieved a stunning secular reversal of the theodicy problem. No longer were we so unsophisticated as to ask how God could allow human suffering; instead, we merely asked how, by harnessing the power of science, we could prevent it" (Rosen 2004, 186). This "stunning secular reversal" was generations in the making. It was also not entirely secular, but arose from longstanding debates concerning the relationship between both science and faith, and natural law and the existence of evil. Individuals' responses to the "science as God's provision" theodicies examined here provide important witnesses for the historians' task of testifying to the extraordinary complexity—creative, destructive, and back again—of the history of the relationship between science and religion.

Notes

1. I am grateful to Ted Davis for bringing Hitchcock's natural law theodicy to my attention.
2. A reference to the main character in Shaw's 1909 play, *The Shewing-Up of Blanco Posnet: A Sermon in Crude Melodrama.*

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