Nutrition as a Social Question: 1835-1905

By

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Dedication

For Maddy

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Abstract

This dissertation examines the emergence of nutrition as a social question in the nineteenth-century United States. Though a series of four episodes, I examine how a group of chemists, physiologists, physicians, and social reformers sought to answer the question of how society should feed itself. By framing nutrition as a social question, these diverse actors made the subject of nutrition into a complex, urgent problem. Armed with insights from political economy, the natural sciences, and social thought, the American framers of nutrition as a social question sought to draw popular and expert attention to American dietary practices in order to bring them into a more harmonious alignment with their own visions of healthy bodies within a healthy society. This dissertation challenges the conventional perception of American nutrition science as a tool of social control, casting it instead as the product of a diverse set of scientific, social, and moral imperatives.

I use a biographical approach to examine how the framers of nutrition as a social question stitched together their agendas for nutrition from their religious and social beliefs and their scientific and medical training. These figures shared an interest in improvement, whether it be moral, social, technological, or a mix of all three; and a belief that their interventions would be the agent of this improvement. They further shared a focus on imbuing people's actions and consumption patterns with moral valence and social importance. The formation of nutrition as a social question began with the introduction of political economy into questions of diet in the 1830s, which allowed for individuals' choices in diet to be linked with the health and stability of the society they lived in. Nutrition as a social question took further shape at midcentury, in the context of managing the dietaries of institutions, like prisons, alms houses, and armies, which brought their managers' attention to how diets for relatively homogeneous populations could be created to reach a desired social end, and how the quantified language of physiological chemistry could help them do it. In the

late nineteenth century, framing nutrition as a social question was tied to a search for a dietary standard that would not only preserve people's health and strength, but also actively promote human flourishing, both nationally and internationally. The framers of nutrition as a social question in the nineteenth century established the contemporary discipline of nutrition in the United States, casting it as a way to care for the social body.

Introduction: A View from Above

> To the blinded eyes of man it often appears as a punishment that by the sweat of his brow he should eat bread. Hunger is the primary and most powerful spur to work, and only through work comes experience and progress. If we were provided with sufficient available energy for life we would ever remain in an undeveloped state. In a country where nature with outstretched arms offers [an] excess of nourishment which is obtainable without effort, one will seek in vain for independent, driving progress.

When the German physiologist Carl von Voit wrote these words, he invoked what many in his field considered a truism: the nutrition of a people was intimately tied with the growth and development of a society.[1] A society's struggle to improve itself and to compete with other nations depended upon the labor of well-fed, strong people, and conversely, the people's who were not hungry would not experience progress. This connection was true for the late nineteenth century as well as eternal, as is clear from Voit's reference to God's injunction to Adam as he was expelled from Eden.[2] So profound did the observation strike Voit's student, the American physiologist Graham Lusk, that he placed his mentor's remark at the beginning of his book *A History of Metabolism* (1922), about the development of the concept of energy for life. In drawing the reader's attention to the relationship between labor, nutrition, and social progress, Lusk was asserting a set of ideas about the materiality of the body that took hold over the course of the nineteenth century and that made it possible to connect a person's eating habits to society as a whole. Lusk understood nutritional chemistry and physiology as helping to establish the connection between human health and social progress, and nutrition scientists like himself as the stewards of this connection. If food made the man, than the food chosen to make him needed to be guided by sound science and good advice.

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[1] Graham Lusk, *A History of Metabolism* (New York, 1922), 3. Lusk does not provide a citation or date for the Voit quote.

[2] Genesis 3:19 (New Revised Standard Version).

By linking nutrition to social progress and healthy societies, Lusk, following Voit, set the agenda for nutrition scientists at the turn of the twentieth century: to use nutrition as a means to ensure human flourishing. This dissertation explains how this agenda came into being in the United States. More specifically, it uncovers the recognition of nutrition as a "social question." Social questions are problems perceived as being complex, urgent, universally relevant and vitally important; solving them would ensure social progress, but it required both expert knowledge and broad popular engagement in order to do so. The historian Holly Case has recently described how the rhetoric of the social question became a notable feature of nineteenth-century intellectual history. According to Case, social questions were about framing certain social phenomena—labor, say, or women's rights—as complicated, intractable problems that required concerted effort to resolve. As a framing device, the social question underscored that the issue at hand was one that influenced all parts of society, and that it was an urgent one, requiring quick action lest the problem remain a source of continual mischief. Case notes that in the British context, one of the earliest social questions was the "corn question," but any student of nineteenth-century American and European history could chime in with a number of other prominent questions, among them the Eastern question, the Jewish question, the animal question, the labor question, and the woman question.[3]

This dissertation argues that the history of nutrition science in the nineteenth century is best understood as the emergence of a social question. This approach is warranted because nutrition is distinctive among scientific disciplines, as its development has been marked by its interdisciplinarity and social mission. Nutrition science comprises the basic sciences of chemistry and physiology in order to describe the chemistry of foodstuffs and the physiology of digestion and absorption. Yet

[3] Holly Case, "The 'Social Question,' 1820–1920," *Modern Intellectual History* 12 (April 2015): 1–29, doi:10.1017/S1479244315000037.

concentrating only on the development of nutritional chemistry and physiology misses an essential aspect of nutrition's development. Nutrition science is also fundamentally an applied science, drawing from social science approaches that allow nutrition scientists to survey the diets of a population as well as to design interventions into them, and deeply influenced by developments in the broader culture. The twentieth-century nutrition scientist Jean Mayer's observation in 1986 that "nutrition science is not a discipline, it is an agenda" is an apt way to describe nutrition science's special status, as it underscores the fact that nutrition is always interdisciplinary, and always socially engaged.[4]

In the phrasing of the nineteenth century, nutrition was often referred to as "the food question." The phrase crops up first in British publications and political discourse in the context of responses to the Irish Famine in the late 1840s, a problem that was in part a crisis of imperfect distribution of food as the British government refused to halt exports of food from Ireland or to provide effective relief to its starving people after the failure of the potato crop.[5] In this case, the food question centered around food scarcity; potential responses to the question included encouraging British landowners to mechanize the work in their fields, thereby saving the fodder and food "spent" on draft animals and agricultural laborers and freeing it for other use.[6] The food question also appeared in the American context during the Civil War to describe the pressing need to alleviate the near-famine conditions experienced throughout the Confederacy, and particularly in

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[4] This quote from Mayer is the mission statement of the Friedman School of Nutrition Science and Policy at Tufts University. Quoted in Elizabeth Neswald, David F. Smith, and Ulrike Thoms, *Setting Nutritional Standards: Theory, Policies, Practices* (Rochester, NY: University of Rochester Press, 2017), 1; Jean Mayer, "Social Responsibilities of Nutrition Scientists," *Journal of Nutrition Science* 116 (May 1986): 714–717.

[5] "Home Correspondence: The Food Question," *Gardeners' Chronicle and Agricultural Gazette,* October 3, 1847, 708; "The Food Question: Ireland," *Gardeners' Chronicle and Agricultural Gazette,* November 13, 1847, 756.

[6] Civis, *The Food Question: Suggestions in a Letter to the Right Honorable the Lord John Russell, on the Means of Increasing the Supply of Food Throughout the British Empire* (London: J. Davy & Sons, 1847), 1; John T. Osborn, *The Food Question: Shewing the Effects Which Steam Power Applied to Agriculture Would Have on Increasing the Supply of Food, throughout Great Britain, Ireland, and the Colonies* (London: Smith, Elder and Co., 1847).

the Confederate Army. The popular press in both the North and the South called to shift the South's agricultural production away from export crops like cotton and tobacco—which could not be reliably snuck through the Union blockade of Southern ports and traded for foodstuffs—toward cereal grains and the raising of pork, beef, and mutton for the army and the people.[7]

From the late 1860s until the end of the century, the use of the term "the food question" shifted away from crises in food production and distribution toward the nutrition of the laboring classes. It was around this period, too, that the terms "labor question" and "social question" were used interchangeably, a point that is reflected in the historical literature on the social question.[8] The food question was a problem of budgeting: how could the growing class of laborers find the means to feed themselves on their wages?[9] Toward the end of the century, the food question came into its own as a fusion of concerns stemming from political economy, like the proper diet for workers' maximal productivity, as well as ethical ones that pointed toward solutions that would ensure physical and moral health. The food question in this period was cloaked in lofty language that gave it the appearance of vital importance and pointed toward the complexities inherent in unraveling it. The food question was the "key to domestic felicity and general health, as well as an economic question linked inseparably with the vitality and maintenance of man," as one 1894 commentator put it.[10]

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[7] See, e.g., "Important from the South: Growing Magnitude of the Food Question," *New York Times*, April 26, 1863; "Chivalry and Grub: South Carolina on the Food Question," *New York Times*, April 16, 1863; "The Food Question," *Charleston Mercury,* April 14, 1863.

[8] Alice O'Connor, *Social Science for What?: Philanthropy and the Social Question in a World Turned Rightside Up* (New York: Russell Sage Foundation, 2007).

[9] M.P. *The Food Question and the Budget*, *1869* (London: P. Bentley and Co., 1869); "The Food Question," *Scientific American* 12, no. 46 (1857): 363; Thomas M. Nichol, *The Labor Question, in Its Relation to Political Parties: An Address to Workingmen* (publisher not identified, 1886), 11 https://books.google.com/books?id=aNWskjB8oyUC.

[10] "The Food Question: To Be Scientifically and Comprehensively Discussed," *Good Housekeeping*, September 1894, 186–87.

My analysis of the development of nutrition as a social question encompasses the issues raised by the use of the term "the food question" in nineteenth-century newspapers and journals, but seeks to go beyond these more limited examples. In this dissertation I analyze cases through which nutrition in the United States came to be framed as a complex, urgent problem that was universally relevant and vitally important, taking into account the religious, political, and social concerns that shaped the tone and focus of interventions into popular diet. The framing of nutrition as a social question coalesced between the first third of the nineteenth century to the end of the century around attempts to solve specific problems. Reformers sought to align the development of nutritional physiology and chemistry with changing notions of social welfare, notions that encompassed both the working class and the middle classes. Each of the chapters in this dissertation explores a different facet of this development over the course of the nineteenth century. The first chapter is a pre-history of how nutrition became a social question, showing how diet became linked to political economy in the 1830s. This was an essential step in the framing of nutrition as a question, as it removed food consumption as the exclusive concern of the medical care of individuals and turned it into a means for ensuring the broader health of society. The next two chapters tackle the integration of nutritional chemistry and physiology into diet. As physiological chemistry grew in sophistication at midcentury, a new quantified language of nutrients helped scientists design diets for populations in prisons, asylums, and armies, making the inmates and soldiers' diets legible and providing a mechanism for altering them. Both case studies concern the use of the natural sciences to intervene in the diets of populations, as an intermediate step in the development of nutrition as a social question. The final two chapters delineate the knitting together of political economy, chemistry and physiology, and social thought that made nutrition into a social question. In the last third of the century, nutrition scientists and social reformers became fully convinced of the social utility of nutrition, and began to explicitly portray their interventions into

popular diet as a type of benevolent social engineering, one that would bring all people up to a higher plane of living. These chapters uncover the final articulation of all aspects of nutrition as a problem that must be resolved in order to attain social progress. My dissertation shows how the larger history of nutrition in the nineteenth century is a broadening of scope: from individuals, to groups, to society as a whole.

Scientific and medical attention to diet of course precedes the formation of nutrition as a social question, as Galenic medical theory directed physicians' and patients' attention to regulating diet as a means to ensure health.[11] The historians Steven Shapin and Anita Guerrini have shown that moderation and adjusting diet to one's station in life were considered essential for health in the early modern era. Individuals knew best what was good for them, and knowing how to use diet to safeguard one's health was part of what it meant to be an autonomous, rational actor in society. A person who ate and drank too much, or was inordinately concerned with his health, allowed what was bestial in him to hold sway over his rationality. Medical advice provided broad guidelines for moral and bodily alimentation, but the essential point was for each person to follow his own appetite to keep himself in good condition.[12]

The dietary consensus began to change in the eighteenth century as chemists and physiologists sought to extend their authority over diet, undercutting the authority of self-knowledge by asserting that there was an objective standard for diet that lay outside the bounds of individual

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[11] Noga Arikha, *Passions and Tempers: A History of the Humours* (New York: Ecco, 2007).

[12] Steven Shapin, "How to Eat Like a Gentleman: Dietetics and Ethics in Early Modern England," in *Right Living: An Anglo-American Tradition of Self-Help Medicine and Hygiene* (Baltimore, MD: Johns Hopkins University Press, 2003), 21–58; Steven Shapin, "Trusting George Cheyne: Scientific Expertise, Common Sense, and Moral Authority in Early Eighteenth-Century Dietetic Medicine," *Bulletin of the History of Medicine* 77, no. 2 (2003): 263–97, doi:10.1353/bhm.2003.0091; Anita Guerrini, *Obesity and Depression in the Enlightenment: The Life and Times of George Cheyne*, Oklahoma Project for Discourse and Theory, v. 3 (Norman, OK: University of Oklahoma Press, 2000).

experience.[13] As the historian Elizabeth Williams notes, investigators studying diet in the late Enlightenment became concerned about the fallibility of human reason. As George-Louis Leclerc, comte de Buffon, noted in his *Histoire Naturelle* (1749), while animal appetites were reliably guided by smell and taste, humans relied on the higher senses of sight and touch to find appropriate food; these senses were more noble but also prone to error when combined with bad judgment.[14] In the Enlightenment vision of the body, scientific evidence could provide an objective guide if intuition could not. This tension between science and intuition as a guide to diet took on further significance in the nineteenth century. Individuals' own reasoned self-knowledge became more suspect as the search for an objective guide for diet intensified and the idea of "common sense" in diet began to fray.

The framing of nutrition as a social question was in part reliant on developments in chemistry and physiology in the nineteenth century that allowed for greater specificity in quantifying and describing human dietary requirements. The science of nutrition in the nineteenth century was dominated by what Holmes calls the "intake-output" model of nutritional physiology, which saw metabolism as the exchange of matter between an organism and its surroundings as the body renewed itself through the assimilation of food and the removal of waste products.[15] The intake-output model stemmed from investigations into how the body created heat, beginning with the chemist Antoine-Laurent Lavoisier's 1777 oxidation theory of combustion. Lavoisier theorized that

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[13] E. C. Spary, *Eating the Enlightenment: Food and the Sciences in Paris* (Chicago: University of Chicago Press, 2012); Spary, *Feeding France: New Sciences of Food, 1760–1815* (Cambridge: Cambridge University Press, 2014).

[14]Elizabeth A. Williams, "Sciences of Appetite in the Enlightenment, 1750–1800," *Studies in History and Philosophy of Biological and Biomedical Sciences* 43, no. 2 (June 2012): 392–404.

[15] Frederic L. Holmes, "The Transformation of the Science of Nutrition," *Journal of the History of Biology* 8, no. 1 (1975): 135–44. Holmes, "The Intake-Output Method of Quantification in Physiology," *Historical Studies in the Physical and Biological Sciences* 17, no. 2 (1987): 235–70.

respiration was a slow combustion that took place in the lungs, which produced the body's heat.[16] The analogy between respiration and combustion became a literal one for those nineteenth-century chemists and physiologists who based their science on philosophical materialism. The model of metabolism promulgated by the German chemist Justus von Liebig in the 1840s and his followers for the rest of the century saw the body as akin to an engine that produced heat and work in proportion to the food it ingested.[17] The physiologist Hermann von Helmholtz articulated this perspective in his 1854 lecture "On the Interaction of Natural Forces," positing that there was no difference between the force exerted by a worker and the force exerted by a machine: in both instances fuel was converted into labor using essentially the same chemical processes of combustion.[18] The intake-output model of metabolism came also to be known as the animal machine metaphor. This was a powerful notion in science, culture, and politics, and the rise of the intake-output model of nutrition science served as the scientific background to the nutrition question. It allowed scientists and reformers to measure the energy balance of a single individual, and to extend these measurements to estimate the nutritional inputs necessary for optimal labor outputs of groups of people.

While the animal machine metaphor trained scientists' focus on the measurement of a body's food and work, an allied metaphor helped direct their attention to the way that diet affected society as a whole. The social organism metaphor stressed how individuals make up a society in the same way that cells and organs constitute a body, and thus the study of popular diet was a way to

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[16] Everett Mendelsohn, *Heat and Life* (Cambridge: Harvard University Press, 1964) pp. 134-5, 149-50.

[17] Elmer Verner McCollum, *A History of Nutrition; the Sequence of Ideas in Nutrition Investigations* (Boston: Houghton Mifflin, 1957); Kenneth J. Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition* (Cambridge: Cambridge University Press, 1994).

[18] Hermann von Helmholtz, "On the Interaction of Natural Forces," trans. John Tyndall, *American Journal of Science and Arts* 24, no. 71 (1857): 189–216.

ensure the health of the social organism. The metaphor could be evoked in different contexts and with different ends: in the 1830s it was a way to emphasize the importance of the individual knowing his or her own body and taking intelligent care of it as a way to contribute to the broader society; by the end of the century it was a way for experts to justify taking the role of providing dietary guidance to others. While the animal machine metaphor took the natural sciences as its starting point, the social organism metaphor in nutrition borrowed the language of the social sciences as well as the technique of measuring and surveying parts of society. This was done in the service of trying to understand the diet of a people, its merits and deficiencies, in order to discern what was excellent about it our how it might be improved. As an economist wrote in 1896, the law binding the labor power of nations to their diet had reached "the stage of an empirical truth" based on social scientific studies of the "conditions of existence of definite groups of average peoples," and he predicted it would soon become a law in physiology.[19]

Science served as the central intellectual resource for the framing of nutrition as a social question, but was not the only influence. Nineteenth-century America was a deeply devout place, and a common thread among the reformers who worked on nutrition in this period was their Protestant faith. In the first part of the nineteenth century, the religious roots of ideas about diet were explicit. Right conduct and right regimen were necessary to remain in a state of grace, and science served as the source of rules about bodily management.[20] In the period, the term "physiology" did not refer explicitly to experimental science. Instead, it broadly described the principles of health and hygiene that, if learned correctly and applied assiduously, would provide the

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[19] Francesco S. Nitti, "The Food and Labour-Power of Nations," *Economic Journal* 6, no. 21 (March 1896): 30–63.

[20] Thomas A. Horrocks, *Popular Print and Popular Medicine: Almanacs and Health Advice in Early America* (Amherst: University of Massachusetts Press, 2008), 72; Charles E. Rosenberg, "Medical Text and Social Context: Explaining William Buchan's Domestic Medicine," in *Explaining Epidemics and Other Studies in the History of Medicine* (New York: Cambridge University Press, 1992), 32–62.

basis for correct physical and moral development.[21] Later in the century, faith became a more subtle presence in nutrition, taking a subordinate role in the popular discourse about nutrition yet serving as a goad to continued efforts to teach others about the right way to care for themselves. Religion allowed for the creation of an ethos of care among the community, but that ethos cut both ways. It could direct reformers' attention to ameliorating injustice and inequity; it could also blind a person to his own paternalism and condescension. Taken as a whole, the religious faith of nineteenth-century nutrition reformers helped them answer the question of what was due to an individual, and what one owed to others.

Beyond the religious duty to regulate one's dietary intake, there was also an economic imperative. In the nineteenth century, a naturalization of economic thought brought people's food habits in line with political economy. As the historian M. Norton Wise has written, seeing the economy as a natural system was a common mode of thought among scientifically literate people in the first third of the century, and the same phenomenon can be observed among Americans in this period. The natural economy was comprised of two opposing forces in equilibrium: work and waste. This notion of balance appeared in natural philosophy as the equilibrium between energy and entropy, in chemistry as the balanced chemical equation, in physiology as the balance between respiration and combustion, and in political economy as the balance between population and food supply. As long as both forces balanced one another, wealth, health, and happiness would result; if one force were to overpower the other, disharmony and concomitant social trouble would occur.[22]

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[21]Toby A. Appel, "Physiology in American Women's Colleges: The Rise and Decline of a Female Subculture," *Isis* 85, no. 1 (March 1, 1994): 26–56, doi:10.2307/235895; Stephen Patrick Rice, *Minding the Machine: Languages of Class in Early Industrial America* (Berkeley, Calif.: University of California Press, 2004); Charles Rosenberg, "Catechisms of Health: The Body in the Prebellum Classroom," *Bulletin of the History of Medicine* 69 no. 2 (1995): 175-197; Martha H. Verbrugge, *Able-Bodied Womanhood: Personal Health and Social Change in Nineteenth-Century Boston* (New York: Oxford University Press, 1988).

[22]M. Norton Wise, "Work and Waste: Political Economy and Natural Philosophy in Nineteenth Century Britain (I)," *History of Science* 27, no. 3 (September 1, 1989): 263–301, doi:10.1177/007327538902700302.

Thomas Malthus's 1798 theory of population drew on this notion of balance: if the growth in population outstripped the available food supply, starvation would result. One could take a literal Malthusian view and maintain that periodic starvation was an inescapable fact; the poor must starve if they could not help themselves. The less harsh view taken by those who framed nutrition as a social question was that starvation was avoidable if people could learn to adapt. The workers who were the most vulnerable to Malthusian forces were the targets of the ministrations of reformers: they needed to be taught to regulate their own behavior in accordance with the balance of nature. As Wise notes, thinking of the economy of nature as a kind of balance was the purview of educated Britons who thought that science was an agent of advancement and improvement. Such was the case for Americans engaged in framing nutrition as a social question, from Whigs in the antebellum period through liberals at the end of the century, all of whom sought to bring American dietary habits into line with notions of personal and social equilibrium.

Yet the reign of Malthus was not absolute. Medicine offered a dissenting view from political economy. As one English physician wrote in 1826, the object of political economy was to promote the general good of the community at the possible expense of individuals, and the object of medicine was to protect the health of the most feeble without regard to the welfare of the community. Thus the two disciplines were in conflict.[23] This conflict played out over the course of the nineteenth century, with doctors' concerns for the health of individuals acting as a check on the standardizing power of nutrition science. Physicians had to puzzle through the fact that theoretical or laboratory-based knowledge about diet didn't always square with the food wanted or needed by

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[23] John Ayrton Paris, *A Treatise on Diet* (London: Printed for Thomas and George Underwood, 1826), 127; Christopher Hamlin and Kathleen Gallagher-Kamper, "Malthus and the Doctors: Political Economy, Medicine, and the State in England, Ireland, and Scotland, 1800–1840," in *Malthus, Medicine, & Morality: "Malthusianism" After 1798*, ed. Brian Dolan, Wellcome Institute Series in the History of Medicine (Amsterdam: Rodopi, 2000), 115–40; Christopher Hamlin, *Public Health and Social Justice in the Age of Chadwick: Britain, 1800–1854* (Cambridge: Cambridge University Press, 1998), 25.

their patients. They also had to balance out this knowledge with practical approaches from their own experience. Further, the notion that free persons ought to be able to choose the foods they needed in order to safeguard their health persisted well into the nineteenth century. Physicians insisted on the importance of individual autonomy in health—at least for free, white people whose judgement could be trusted—a view that retained its hold even as advocates for a standardized approach to nutrition pushed for supremacy.

America itself proved a further challenge to the Malthusian paradigm. Americans who looked at their land saw a vast wilderness brimming with resources that had not been prudently exploited by the Native Americans and were therefore available for the taking. This was a central premise of American national identity and nationalism. For Americans of European descent surveying the country in the nineteenth century, the land's abundance rendered scarcity impossible, and the free, white people's habits of industry and restless action acted as a further bulwark against a Malthusian slide into mass starvation. As the intellectual historian Dorothy Ross has noted, the modern social sciences in antebellum America sprang from a nationalist ideology of American exceptionalism. Americans believed that their country was a singular place, peopled by landowning farmers and prosperous artisans and blessed with so much fertile land that the food supply would always outstrip population growth.[24] As such, the country would be spared the class conflict and poverty that had attended urbanization and industrialization in Europe.[25] As nutrition science in America was closely aligned with the social sciences, a widespread sense of American nationalism as refracted through diet is evinced in the literature on nutrition throughout the century. For example, one well-known cookbook author wrote at midcentury that conquering the frontier "could not have

[24] Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002), 34.

[25] Dorothy Ross, *The Origins of American Social Science*, Ideas in Context, no. 19 (Cambridge: Cambridge University Press, 1990), 22–28.

been done by a half-starved, suffering people. A larger quantity and better quality of food are necessary here than would have supplied men in the old countries, where less action of body and mind are permitted."[26] American robustness was tied to the promise of continued improvement, and shaped the development of a distinctly American approach to nutrition.

To read physicians and scientists discussing the nutritional abundance of their country, one would expect that the United States was populated by citizens of uniformly robust health and longevity. Yet, as historical economists have shown, this was not the case: mortality rates increased during the mid-nineteenth century, and both life expectancy and the average stature of adult males declined. While the cause of the rise in mortality is disputed, it is associated with a decline in the availability of protein and calories per capita. Fluctuations in the food supply along with industrialization, rapid urbanization, commercialization of agriculture, high rates of immigration, and a highly mobile population likely contributed to the high mortality rates and short stature of Americans in this period.[27] Generally speaking, white urban laborers in the Northeast were more likely to have higher rates of mortality and to have a shorter stature than rural farm-dwellers, as city people were less well nourished. African Americans and Native peoples also suffered disproportionately from malnutrition and famine.[28] Because this dissertation is a study of the ideas and ideologies that shaped the development of nutrition science in the US, it will take at face value the notion that the framers of nutrition as a social question *believed* in their country's abundance.

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[26] Sarah Josepha Buell Hale, *The Ladies' New Book of Cookery: A Practical System for Private Families in Town and Country; with Directions for Carving, and Arranging the Table for Parties, Etc. Also, Preparations of Food for Invalids and for Children* (New York: H. Long & Brother, 1852), xiv.

[27] Scott Alan Carson, "Nineteenth-century White Physical Activity, Calories and Life Expectancy: Nutrition, Sanitation, or Medical Intervention?," *Journal of Interdisciplinary Economics* 28, no. 2 (2016): 168–201.

[28] Michael R. Haines, Lee A. Craig, and Thomas Weiss, "The Short and the Dead: Nutrition, Mortality, and the 'Antebellum Puzzle' in the United States," *Journal of Economic History* 63, no. 2 (2003): 382–413.

However, occasional forays into the social conditions of Americans, as understood by social historians and historical demographers, will serve as a check on my sources' rosy views.

The ideology of American progress held by the framers of nutrition as a social question sat alongside their political, religious, and cultural conservatism. These workers by and large evinced an interest in social betterment without a corresponding commitment to social change or a reshuffling of the social hierarchy. Theirs was a vision of social improvement that portrayed a flourishing people armed with the knowledge to keep themselves healthy. The framers of nutrition as a social question knew that no universalist notions would fit everyone, but they thought that a well-informed people, both working class and middle class, would have a cheerful willingness to wisely apply this knowledge to their own lives. This vision of human betterment was devoutly held and earnestly worked for, but it essentially made nutrition into a science of making do with the resources available. This dovetailed with the belief in American abundance held by framers of the nutrition question; they thought there was already enough to go around.

The essential conservatism of the framers of nutrition as a social question has led many scholars who examine the history of nutrition science in the nineteenth century to conclude that it was primarily oriented toward social control. This is a dominant narrative in the scholarship on food and diet in the United States that my dissertation challenges. Under the social control thesis, nutrition scientists were dedicated to ensuring a stable social order and a moral citizenry, and this was expressed through their advocacy of a set dietary regimen for all Americans.[29] The social control model springs from a Foucauldian approach to understanding science and dietary advice, one where the essential feature of such advice is to discipline people into becoming good citizens who would

[29] Charlotte Biltekoff, *Eating Right in America: The Cultural Politics of Food and Health* (Durham: Duke University Press, 2013); Helen Zoe Veit, *Modern Food, Moral Food: Self-Control, Science, and the Rise of Modern American Eating in the Early Twentieth Century* (Chapel Hill: University of North Carolina Press, 2013); E. Melanie DuPuis, *Dangerous Digestion: The Politics of American Dietary Advice* (Berkeley: University of California Press, 2015).

spend their money on only the most nutritious food. Many of these studies use the history of the late nineteenth century to understand developments in the twentieth, without considering these ideas in their own contexts. The erroneous notion that nutrition science in the late nineteenth century was dedicated to corralling everyone into adhering to a single dietary standard for everyone has led to the critique that it unwisely ignored culinary culture and individual differences in food needs. For example, the rhetorician Jessica Mudry has argued that the US government–led discourse on food has overemphasized quantitative measurements of food so that taste and tradition are completely ignored in favor of numbers: how many calories, how much fat.[30] Likewise, the philosopher Gyorgy Scrinis has asserted that nutrition science in the mid-nineteenth century through the twentieth century has been marked by "nutritionism," or the "reductive interpretation of foods in terms of their fat or nutrient composition."[31] Both Mudry and Scrinis contend that a reductionist approach to dietary advice, one that stresses ingesting a set quantity of nutrients daily, does not serve the broader goal of ensuring human health, and should be abandoned in favor of qualitative measurements that emphasize culture, taste, and culinary tradition. They argue for a return to qualitative standards for diet in order to reduce popular confusion about what to eat as well as to ease the burden of the obesity epidemic, a problem that nutrition science has failed to solve and may have even exacerbated.

These two scholars' critique of nutrition science correctly diagnoses contemporary people's difficulties with understanding nutrition advice and applying it to regular diet. However, a new wave of historical scholarship, including this dissertation, demonstrates that nutrition science in the nineteenth century was a much more multifaceted process than Scrinis and Mudry have portrayed

[30] Jessica Mudry, *Measured Meals: Nutrition in America* (Albany: State University of New York, 2009).
[31] Gyorgy Scrinis, *Nutritionism: The Science and Politics of Dietary Advice* (New York: Columbia University Press, 2013).

it.[32] In general, the scholarship on food and diet would benefit from integrating the history of science and medicine more closely.[33] E.C. Spary, David Gentilcore, Shapin, Guerrini, and Williams have produced studies of nutrition in the early modern and Enlightenment eras, and there are many works on nutrition in the twentieth century.[34] With the exception of biographies of Sylvester Graham and Justus von Liebig, the history of nutrition in the nineteenth century, especially before the 1880s, has been largely neglected.[35] In particular, the interplay between science and social thought that has shaped the development of nutrition science and of dietary standards is quite complex, and it does no justice to this history to assume that nutrition scientists were solely focused on policing the dietetic mores of the working class. Instead, nutrition scientists were motivated by a host of interlocked social, political, religious, and scientific considerations, social control being only one of them. As this dissertation will show, attempts to control people's dietary habits were faced with scientific and social difficulties, making it impossible for such control to be achieved by even the most zealous of reformers.

This dissertation is chiefly in dialogue with the work of scholars who consider the linkages among political economy, labor, and diet in European intellectual history. My work explores how many of these ideas were understood in the American context. In his 1992 work *The Human Motor*,

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[32] Elizabeth Neswald, David F. Smith, and Ulrike Thoms, introduction to *Setting Nutritional Standards: Theory, Policies, Practices,* eds. Neswald, Smith, and Thoms (Rochester, NY: University of Rochester Press, 2017), p. 4.

[33] For example, Jeffrey Pilcher's recent review article on food in history makes little mention of the history of science and medicine. Jeffrey M. Pilcher, "The Embodied Imagination in Recent Writings on Food History," *The American Historical Review* 121, no. 3 (June 1, 2016): 861–87, doi:10.1093/ahr/121.3.861.

[34] Examples of recent histories of twentieth-century nutrition include: Matthew Smith, *Another Person's Poison: A History of Food Allergy* (New York: Columbia University Press, 2015); David Smith, *Nutrition in Britain: Science, Scientists and Politics in the Twentieth Century* (London: Routledge, 2013); Andrew Ruis, *Eating to Learn, Learning to Eat: The Origins of School Lunch in the United States* (Brunswick: Rutgers University Press, 2017); Aleck S. Ostry, *Nutrition Policy in Canada, 1870-1939* (Vancouver: UBC Press, 2006); Corinna Treitel, *Eating in Modern Germany: Food, Agriculture, and Environment, c. 1870-2000* (Cambridge University Press, 2017); Alexander R. Bay, *Beriberi in Modern Japan: The Making of a National Disease* (Rochester, NY: University of Rochester Press, 2012).

[35] William H. Brock, *Justus von Liebig: The Chemical Gatekeeper* (Cambridge: Cambridge University Press, 1997); Stephen Nissenbaum, *Sex, Diet, and Debility in Jacksonian America: Sylvester Graham and Health Reform* (Westport, Conn.: Greenwood Press, 1980).

the cultural historian Anson Rabinbach identified the animal machine metaphor as a central concept in materialist thought and politics. He argued that beginning in the mid-nineteenth century, physicists and physiologists were no longer interested in the distinction between the animal machine and the human body; conceptually, they merged to become the guiding metaphor for a number of scientific, political, and cultural inquiries into labor and the nature of fatigue, undertaken as a means to discipline workers.[36] Rabinbach's identification of the protean nature of the animal machine metaphor has been a useful notion for this work, though it is notable that his discussion does not take up hunger and undernutrition as problems that contemporaneous European social thinkers and scientists were interested in solving. Further, the animal machine metaphor was a flexible one in America, and not just a means for reducing the worker to the fact of his labor. The historian Dana Simmons also takes up the question of diet in its relation to labor and political economy in her 2015 book, *The Vital Minimum: Need, Science, and Politics in Modern France.* In it, Simmons tracks the development of standards of living in nineteenth- and twentieth-century France. A "science of human needs," based on agronomy, chemistry, economics, sociology, and anthropology, developed in this period in order to organize and direct labor and subsistence, setting wages in relation to work.[37] Many of the Americans discussed in my dissertation read and interpreted the French scientists Simmons identifies as founders of these standards of living. Yet American social beliefs—particularly the country's dominant Protestant religiosity, its faith in abundance, the relatively light hand of its state government, and its skepticism toward scientific research—meant that the science of human living developed differently in the United States than it did in Europe. Nutrition science

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[36] Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (Berkeley: University of California Press, 1992).

[37] Dana Simmons, *Vital Minimum: Need, Science, and Politics in Modern France* (Chicago: University of Chicago Press, 2015), 5–9.

took shape as a way to manage the diet of the workers, but it was also an inquiry into what all people ought to allow themselves, rather than an effort to allocate scarce resources.

This dissertation uses a biographical approach to reconstruct the cultural and intellectual contexts of its subjects. In recent decades, the value of biography as a means to illuminate the creation of scientific expertise as well as the personae of scientists has been amply demonstrated.[38] Biography is further a useful tool for illuminating how scientific and medical expertise intertwines with cultural values. However, the biographical approach is largely missing from the social history of medicine.[39] Social history remains the dominant mode of writing the history of medicine, and medical historians have a tendency to set the "bottom up" approach to writing history in opposition to studies of pivotal figures and their social and intellectual contexts.[40] However, avoiding biography means neglecting a useful tool for uncovering how scientific and medical experience intertwines with cultural values. Medical ideas were created by people working in specific contexts that shaped the developing form of their ideas about health. This is particularly the case for the history of medicine because the notion of health is so broad and metaphorically rich. We can speak of the health of individuals but also of society, of somatic diseases as well as behaviors. Wielding biography as a tool

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[38] See, e.g., Margaret W. Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840-1880*, Yale Studies in the History of Science and Medicine 9 (New Haven: Yale University Press, 1975); Gerald L. Geison, *The Private Science of Louis Pasteur* (Princeton, NJ: Princeton University Press, 1995); William H. Brock, *Justus von Liebig: The Chemical Gatekeeper* (Cambridge: Cambridge University Press, 1997); Mary Terrall, *The Man Who Flattened the Earth: Maupertuis and the Sciences in the Enlightenment* (Chicago: University of Chicago Press, 2002); Giuliano Pancaldi, *Volta: Science and Culture in the Age of Enlightenment* (Princeton, NJ: Princeton University Press, 2003); Laura Otis, *Müller's Lab: The Story of Jakob Henle, Theodor Schwann, Emil Du Bois–Reymond, Hermann von Helmholtz, Rudolf Virchow, Robert Remak, Ernst Haeckel, and Their Brilliant, Tormented Advisor* (Oxford: Oxford University Press, 2007); Jan Golinski, *The Experimental Self: Humphry Davy and the Making of a Man of Science* (Chicago: University of Chicago Press, 2016).

[39] Beth Linker, "Resuscitating the 'Great Doctor': The Career of Biography in Medical History," in *The History and Poetics of Scientific Biography,* ed. Thomas Söderqvist (Aldershot, UK: Ashgate, 2007).

[40] Exceptions to this observation include Bonnie Ellen Blustein, *Preserve Your Love for Science: Life of William A. Hammond, American Neurologist* (Cambridge: Cambridge University Press, 1991); Jacalyn Duffin, *Langstaff: A Nineteenth-Century Medical Life* (Toronto: University of Toronto Press, 1993); Anita Guerrini, *Obesity and Depression in the Enlightenment: The Life and Times of George Cheyne*, Oklahoma Project for Discourse and Theory, vol. 3 (Norman, OK: University of Oklahoma Press, 2000); Arleen Tuchman, *Science Has No Sex: The Life of Marie Zakrzewska, M.D.* (Chapel Hill: University of North Carolina Press, 2006); Michael Bliss, *William Osler: A Life in Medicine* (New York: Oxford University Press, 2007); Bliss, *Harvey Cushing, A Life in Surgery* (New York: Oxford University Press, 2007).

to understand the educational, religious, political, and intellectual commitments of individual healers helps provide a more thorough ground for understanding how the concept of health has been shaped in different time periods and locations.

Biography is warranted in this dissertation because nutrition as a social question emerged in very specific cultural and intellectual contexts, so a granular focus on the education, political and religious commitments, and networks of friends and interlocutors of each of the people who framed it is valuable and essential to give a full accounting of the question's genesis and evolution. The American framers of nutrition as a social question moved in intellectual networks in the United States and Europe. The American branches of these networks were elite and circumscribed, focused in and around the major cities of the East Coast. Chemistry and physiology in the country were largely in the hands of amateur scientists, whose exposure to the work of European scientists like Jean-Baptiste Dumas, François Magendie, Jean-Baptiste Boussingault, and Justus von Liebig came through books and journals that crossed the Atlantic. However, there were also a few Americans who would cross the Atlantic themselves to study at Giessen, the Munich Physiological Institute, and other centers of experiment and instruction. My view of chemistry and physiology as a trans-Atlantic culture is informed by Leslie Butler's portrayal of the trans-Atlantic culture of liberalism in the antebellum period, Daniel Rodgers's depiction of similar exchanges in the Progressive Era, Margaret Rossiter's work on the development of American agricultural science, and John Harley Warner's study of the influence of French ideas on American medicine.[41] These works' depictions of how ideas were shared across the Atlantic and how American thinkers interpreted and modified

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[41] Leslie Butler, *Critical Americans: Victorian Intellectuals and Transatlantic Liberal Reform* (Chapel Hill: University of North Carolina Press, 2007); Daniel T. Rodgers, *Atlantic Crossings: Social Politics in a Progressive Age* (Cambridge, MA: Harvard University Press, 2000); Margaret W. Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840-1880*, Yale Studies in the History of Science and Medicine 9 (New Haven: Yale University Press, 1975); John Harley Warner, *Against the Spirit of System: The French Impulse in Nineteenth-Century American Medicine*, 2nd edition (Baltimore: The Johns Hopkins University Press, 2003).

European ideas directed my attention toward similar exchanges in nutrition science. Even when there was no personal contact between these thinkers, networks that built nutrition science were constructed by shared assumptions and ideas; essentially, knit together by books and journals.

A biographical approach to the history of nutrition science in nineteenth-century America is particularly in order due to the fact that the framers of nutrition science worked outside of conventional disciplines: up until the twentieth century there was no central institution or laboratory for nutrition science where students might gain training in a discipline and a concomitant worldview. Their research was supported by state institutions, like the New York Geological Survey, the Smithsonian Institution, the Departments of Agriculture and Labor, and the US Army. But in the nineteenth century, private organizations were often a more powerful force than government for the purposes of organizing inquiry and putting ideas into practice, especially in health. For example, the American framers of nutrition as a social question worked with groups like settlement houses, the New York Prison Association, and the New York Association for the Improvement of the Condition of the Poor, and scientific knowledge and occasional financial support for research was fostered by agricultural journals like *The Cultivator* and the *Prairie Farmer*. Networks of reformers from different Protestant traditions also helped connect men of similar faith and outlook to work on projects of joint interest, and physicians and other professions organized formal inquiries into the diet of the people. The noninstitutionalized nature of nutrition in the nineteenth century means that the networks of intellectual exchange mentioned above were all the more influential in its shaping. Given the distinctive combination of elements of the social sciences, the natural sciences, and social thought in nineteenth-century nutrition science, it is essential to show how each worker constructed his intervention into popular diet from these elements. None of the figures in this dissertation is a "pivotal figure" in the history of science; instead, they are notable for their attempts to interpret others' scientific work and apply it in new contexts. The common threads linking these

figures relate to a mindset that saw social problems as vitally important as well as solvable: this mindset was influenced by a commitment to religious thought, a Whiggish belief in scientific and social progress, and a cultural conservatism that shaded into paternalism. The creators of American nutrition science thought that science, social amelioration, and progress were fused, and that their vision of a better diet would be both universally agreeable and a way to make a better society.

Nutrition became a social question gradually over the course of the nineteenth century. As famine or chronic food shortages were not considered to be a problem in the American context, there was not a continual, pressing need to regulate the American food supply. Instead, nutrition became relevant only sporadically, in the context of a crisis, either real or perceived, that seemed to necessitate a technocratic intervention into diet. Further, the advent of new intellectual tools for understanding and measuring the body's physiological needs gave form and substance to budding nutrition experts' claims to authority, and allowed them to overcome traditional medical opposition to the idea of a standardized diet. In the 1830s, the nascent science of political economy began to draw attention to the nutrition of the people, and the scientific discipline of comparative anatomy offered a way to show what food best suited the digestive system of man. Nutrition as a social question was shaped by the rise and fall of Justus von Liebig's model of animal nutrition, from the 1840s through the 1860s, and concluded with the institutionalization of energetics as the dominant model for understanding the body's food needs. As one observer put it in 1834, diet was a topic that offered such "rare opportunities alike for profound research, for self-conceited and opinionated dogmatism, and for visionary novelties," and this dissertation will document all three. [42]

[42] Luther V. Bell, *A Dissertation on the Boylston Prize-Question for 1835: What Diet Can Be Selected Which Will Ensure the Greatest Probable Health and Strength to the Laborer in the Climate of New England?—Quantity and Quality, and the Time and Manner of Taking It, to Be Considered* (Boston: D. Clapp, Jr., 1836).

The first chapter examines an effort by a group of New England physicians in the 1830s to align the moral order by developing a correct dietary regimen for the workers of New England. I focus on a dispute between the physician and Whig politician Luther Bell and the diet reformer Sylvester Graham, a fiery and controversial advocate of vegetarianism. This debate took place just as the nascent science of political economy was drawing physicians' attention to the question of the diet of workers and casting it as a potential problem. Bell argued that the broader health of society rested on their continued good health. Graham's attack on dietary orthodoxy was the impetus for Bell to offer dietary advice to New England workers, in such a way that cast diet as analogous to other Whig projects of national improvement. Bell's "Whig Diet" marshaled moral philosophy, political economy, comparative anatomy, and medicine in order to fit diet into a broader moral and social order, one where man's ability to reason outweighed instinct. Bell's debate with Graham was a first step toward the formation of nutrition as a social question, as it cast diet as a matter of broader social concern.

My second chapter explores an early attempt to develop an institutional diet for wards of the state, and in doing so shows how an explicitly articulated nutrition science was ascribed social utility. In the early 1850s, the Quaker chemist and prison reformer John Stanton Gould was commissioned to design a diet for the almshouses and prisons of New York City. In the wake of the Irish famine, the city faced what was essentially a refugee crisis, and Gould contended that one solution for it was to find a more economical way to feed the influx of immigrants coming from Europe. Gould undertook this project during the mid-century apogee of chemists' confidence in their ability to improve the human diet, thanks to new developments in animal and agricultural chemistry, and he was eager to use this new knowledge to create an institutional diet. As a Quaker, however, Gould was equally devoted to science and to religion, and the diet he designed aimed not just to maintain inmates' physiological health, but to promote their spiritual well-being as well. This chapter

highlights the melding of Gould's religious and social values with his scientific and medical knowledge in the creation of an institutional diet that sought to serve the ends of both economy and justice.

My third chapter explores an instance of medical resistance to the notion that nutrition could be framed as a social question, by analyzing a clash between chemistry and medicine in the quest for better military rations. At the height of the Civil War, the chemist and entrepreneur Eben Norton Horsford approached the Union Army with a proposal for a condensed army ration that would replace bulky fresh bread and meat. The urgency of the question was underscored by the need to have a more efficient fighting force to win the war, and Horsford's answer to it reflected his belief that chemistry was the preeminent science of improvement of the age. Horsford had trained with the German chemist Justus von Liebig in the 1840s, and his ration used Liebig's chemical model of animal nutrition to create lightweight, portable foodstuffs that equaled the nutritional value of fresh bread and meat. Horsford's ration design rested on the premise that once soldiers' food requirements were known, a chemist could make a perfect and universal ration to meet them. This was a bold claim considering the state of nutritional chemistry, and Horsford faced strong opposition from Army physicians who were skeptical of the notion that chemistry was a valid means for understanding and improving human diet, and particularly attacked Horsford's claims for nutrition science's universal aims. Reflecting tensions in medicine between universalist and specific approaches to understanding illness, Army physicians did not think that chemistry could create standard diets that would apply to all people.

My final two chapters uncover an effort to definitively formulate nutrition as a social question, and to find a means to solve it, by examining the work of the chemist W.O. Atwater. Atwater is an important figure in the development of American nutrition science, as many of the central ideas in it sprang from his work or were popularized by him. However, he is not well

understood by many scholars who study food in America, and this dissertation seeks to provide a more complete picture of his ideas and work. Atwater's life work was addressed to determining the relationship between nutrition and a people's productive power and general welfare. In the last third of the nineteenth century, social problems had taken on an edge of urgency due to growing inequality, economic crises, and labor unrest, and Atwater intended to put his science to use to help solve these problems. The fourth chapter explores Atwater's social thought, which interwove his religious faith with a faith in technical expertise: once the facts of human metabolism were known, a better human diet could serve as the first step toward social and moral progress. I draw parallels between his ideas with those of his colleagues in social and religious philanthropy, who saw their work as trying to foster community and cooperation around social questions so that broader problems facing the country could be solved.

In my final chapter I turn to Atwater's scientific work and his dietary studies project. A student of Carl von Voit at the Munich Physiological Institute, Atwater brought back to the United States the Munich School of Metabolism's approach to nutrition, an approach dedicated to the study of the energy exchanges in living bodies under different conditions of work and rest. Yet his work was not confined just to the laboratory, but also integrated approaches from the social sciences that he hoped would help him get at the habits of people's daily lives and suggest how these habits might be improved. In the mid-1890s, Atwater initiated a series of dietary studies conducted under the auspices of the Department of Agriculture, surveying the diets of hundreds of representative families of all classes. Atwater intended these studies as a means to provide the raw information required to establish the relationship between a people's capacities for productive work and their diet, which he called "the fundamental basis of human living." He sought to frame people's nutrition as a social problem that could be solved, not just in the United States but in the world as a whole.

However, nutrition could never be "solved" in the way some of its workers intended, and this fact was built in to the framework of seeing it as a social question. Nutrition, like all social questions, was a complicated, intractable problem, so all answers to it were necessarily preliminary, and subject to further study. The solution always lay in the future. As Atwater's daughter, the home economist Helen Atwater, wrote in 1917, nutrition experts did not yet know all of the answers raised by their investigations. "Exactly how much of each type of food should be included [in a diet] daily or even weekly, few would care to say," she noted, as more research was needed.[43] All of the framers of nutrition as a social question knew that each person had different food needs, and so the attempt to define a universal nutritional standard was a form of wishful thinking, though one they thought was informed by sound science and their own good intentions. Yet the idea that in the eyes of each framer the food problem would eventually be solvable has to be taken as a given. If each of them had not had the confidence in his own capacity to solve social problems, and the conviction that a solution could be found in the first place, he would not have had the courage or the motivation to enter the arena at all.[44]

[43] Helen W. Atwater, "A Guide to the Nation's Dietary Needs," *Annals of the American Academy of Political and Social Science* 74 (November 1, 1917): 108–18.

[44] For this point I am indebted to Connie Bruck, "Hillary the Pol," *The New Yorker* (May 30, 1994).

Chapter 1: Reason Against Nature: the Whig Diet and its Critics

In June 1834, the health reformer Sylvester Graham (1794–1851) gave a series of sixty lectures on "the science of human life" in Portland, Maine. His lectures, at two hours apiece, gave him ample time to expound on his views on proper regimen, including his call to abstain from alcohol, meat, and sexual intercourse. Graham's beliefs about the human body and its place in nature were a cause for outrage among New England audiences.[45] One Portland lecture-goer, writing about Graham's ideas in the newspaper the *New England Galaxy*, took particular umbrage at the reformer's notion that nature provided the best guide for deciding what to eat and how to live. Graham argued that original, natural man was vigorous and long-lived because he was a vegetarian. Graham contrasted the robustness of the original specimen with the degenerated men of the 1830s; having been enervated by meat, alcohol, and the corrupt nature of society, contemporary people had fallen to a low state of health. The editorialist of the *New England Galaxy* countered this statement by tracing a contrasting history, one in which people had left nature behind as they became more civilized. This was apparent in people's diets as well. Human alimentary history showed an "inevitable progress from barbarism to civilization, from roots and herbs and wretchedness and want ... to the refinements of the table, of good fellowship, of comfort, security and abundance—in a word, to all the luxuries and advantages of social intercourse and social virtue."[46]

Though the *New England Galaxy* writer's profession is unknown, he may well have been a physician. Doctors in New England were already under attack from botanical and homeopathic healers, yet Graham's push to establish a new natural history for nutrition sufficiently alarmed elite New England doctors that they organized a response to Graham and his adherents. In 1835, the

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[45] "Agitation in Portland," *New-York Spectator,* July 21, 1834, 3.

[46] "Sylvester Graham: Pelting with Roses 'Public Lecturer on the Science of Human Life,'" *New-England Galaxy and United States Literary Advertiser,* February 28, 1835, 9, 18.

editors of the *Boston Medical and Surgical Journal* decided that the Boylston Prize, the journal's annual essay competition, would be won by the physician who delivered the best riposte to the "alimentary radicals"—Graham and his adherents—who were agitating the working class with inflammatory statements about what was natural to man. The editors of the journal sought to attract workers to their vision of nutritional orthodoxy though the publication of an essay answering the question, "which diet can be selected which will ensure the greatest probable health and strength to the laborer in the climate of New England?"[47] Why did these doctors feel the need to respond to Graham? To be sure, professional honor was at stake. The Massachusetts reformer had no formal medical training, yet he, like many irregular healers, was prone to making sweeping statements about medicine, dismissing it as a thoughtless effort to cure disease rather than a scholarly inquiry into the nature of sickness and health. Defense of the profession may have been the initial spark for physicians' attempt to push back Graham's ideas, but the real reason lay in the politics and political economy in the 1830s that led doctors to cast their authority over the diet of the working class. That this was the case is indicated by the Boylston Prize Committee's choice of Luther Bell's (1806–1862) winning essay. Bell, a physician and politician, drew on ideas in politics and political economy to make his case for adhering to the standard American diet of the time. One shift in politics was the 1833 founding of the Whig Party, the antebellum opponents of the Jacksonian Democrats. Bell was a devoted member of the Whig party, and believed in its principles of centralized government, moral rectitude, and the civilizing power of reason. Further, ideas in political economy had cast the health and well-being of the individual worker as essential for the broader well being of society, allowing experts like Bell to intervene in diet as a matter of national importance.

In detailing the "Whig Diet," as described by Bell, this chapter analyzes the interaction of science with culture and politics that helped shape nutrition as a social question in the United States

[47] "Editorials and Medical Intelligence," *Boston Medical and Surgical Journal* 13, no. 14 (November 11, 1835): 223–28.

in the 1830s. As a deliberate instance of casting diet as an urgent problem, one that needed to be solved with reference to science and political economy to ensure the well-being of society, Bell's debate with Graham was a first, instance of nutrition being cast as a social question. This chapter first analyzes Graham's ideas about diet to clarify the points on which Bell and Graham differed. Whereas Graham used comparative anatomy and ideas about man's place in nature to provide the evidentiary basis for his theories, which he cast as the height of common sense, Bell's essay on diet drew on political economy, Whig moral philosophy, and comparative anatomy to make a case for an orthodox approach to diet. As Bell framed it, proper diet was a matter of following the dictates of reason and conscience in order to properly govern the self, which included adopting the sensible advice of medical professionals such as himself. The aim of his essay was to strengthen the resolve of laboring men who might otherwise be seduced by Graham's inflammatory rhetoric, and in the process injure their own health and damage society.

A secondary aim of this chapter is to sketch out a history of nutritional orthodoxy in the early nineteenth century, as this dissertation takes as its subject the standard American diet, not diets emerging from irregular physicians. In doing so I fill a lacuna in the history of nutrition in the US, carved out by the fact that most histories of nineteenth-century nutrition tend to focus on alternative healers and diet reformers.[48] This tracks alongside a trend within the history of medicine in America during this period as a whole, as a central narrative in it traces the scuffles between orthodox physicians and irregular practitioners. Physicians in the 1830s–40s were embattled professionals who wished to increase the barriers to entry to the their profession in order to guard their social status. They met their rivals in sectarian practitioners, who offered competing healing

[48] Stephen Nissenbaum, *Sex, Diet, and Debility in Jacksonian America: Sylvester Graham and Health Reform* (Westport, Conn.: Greenwood Press, 1980); Adam D. Shprintzen, *The Vegetarian Crusade: The Rise of an American Reform Movement, 1817-1921* (Chapel Hill: The University of North Carolina Press, 2013). James C. Whorton, *Crusaders for Fitness: The History of American Health Reformers* (Princeton, N.J: Princeton University Press, 1982).

methodologies and an anti-elitist tone that sapped the regular doctors' authority and standing. Further, the debates about status reflected deeply held intellectual and ideological divisions. As the historian Stephen Nissenbaum and others have shown, alternative medicine was a facet of the Jacksonian populist revolt of the 1830s. The sectarians' view argued that just as in religion and politics, medicine had been shrouded in mystery in order to keep out the masses.[49] Alternative healers argued that their methods were clear and easily understood by the common man, as well as more effective than orthodox medicine.

Graham serves as a useful entrée for understanding how deeply diet reform penetrated into 1830s America. As a health reformer without formal medical training, Graham was the first to widely promote vegetarianism in the 1830s, and his work can be seen as an inspiration for a bigger vegetarian movement that took root in the 1840s and 50s.[50] He was also one of a number of diet and health reformers of the period, among them the doctor William Andrus Alcott and the homeopathic physician Russell Trall. Each reformer possessed a greater or lesser appetite for belligerence and notoriety, but much of their advice was similar. Taken in aggregate, their view was that a vegetarian diet, temperance, dress reform, exercise, and cleanliness would produce physical, moral, and social health. As influential as diet reformers like Graham might have seemed because of the attention paid to them by aggrieved orthodox physicians at the time, and by historians of alternative medicine decades later, antebellum diet reformers had at their peak no more than a couple of thousand followers in the reformist stronghold of New England.[51] The popular view of vegetarianism in the period might be best summed up by the poet Walt Whitman, who sniffed that

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[49] Paul Starr, *The Social Transformation of American Medicine* (New York: Basic Books, 1982), 52.

[50] Shprintzen, *The Vegetarian Crusade,* 59.

[51] James C. Whorton, "Patient, Heal Thyself: Popular Health Reform Movements as Unorthodox Medicine," in *Other Healers: Unorthodox Medicine in America,* ed. Norman Gevitz (Baltimore, MD: Johns Hopkins University Press, 1988), 52–81.

the New England vegetarians were "gaunt, hard, melancholy, and unhappy looking persons," and their feebleness was likely due to their not eating meat.[52]

The heat of the debate between the medical establishment and alternative practitioners obscured the fact that the orthodox doctors and vegetarians based their vision of health on many of the same claims about the nature of foods and their effects in the body. For example, Graham's linkage of food and morality was hardly novelty, as this belief was the bedrock principle of nearly all interventions into diet, orthodox and alternative alike. Both unorthodox and regular doctors believed that what one consumed had real consequences, because the intellectual and moral faculties were dependent on the proper functioning of the body. A problem arising from dyspepsia, or indulging in the wrong kinds of foods, could send waves of disturbances to the rest of the body, causing both illness and, potentially, immoral behavior. Likewise, orthodox doctors also promoted the notion that studying human physiology was a way to reveal the work of the Creator, and to follow his laws.[53] The notion that what a person ingested had a moral valence was also promoted by the temperance movement, which was a growing cultural force in 1830s America.[54]

Temperance reformers, which included Graham and even Bell, took as their thesis that ingestion was of prime moral concern. They preached that abstention from harmful articles of food and drink was a sure way to maintain one's virtue.[55] Central to the temperance movement was the medical claim that certain foods acted as stimulants—meat and alcohol in particular—and that true

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[52] Mose Velsor [Walt Whitman], "Manly Health and Training, With Off-Hand Hints Toward Their Conditions," ed. Zachary Turpin, *Walt Whitman Quarterly Review* 33, no. 3 (2016): 223.

[53] See, e.g., John H. Griscom, *Animal Mechanism and Physiology; Being a Plain and Familiar Exposition of the Structure and Functions of the Human System,* Harper's Family Library, no. 85 (New York: Harper & Brothers, 1839).

[54] Ian R. Tyrrell, *Sobering Up: From Temperance to Prohibition in Antebellum America, 1800–1860* (Westport, CT: Greenwood Press, 1979); Matthew Warner Osborn, *Rum Maniacs: Alcoholic Insanity in the Early American Republic* (Chicago: University of Chicago Press, 2014).

[55] Luther V. Bell, "An Address Before the Young Men's Entire Abstinence Association: Derry, N.H. July 4, 1832" (Concord, NH: Statesman Office, McFarland & Ela, 1832).

health lay in not overstimulating the body, lest disease be provoked. On a superficial level, the difference between the orthodox and the irregulars lay simply in the question of just how dangerous stimulants could be. Vegetarians thought that alcoholic drinks and meat were fundamentally artificial and foreign to man's nature, so it would be wise to avoid them entirely. Advocates of meat eating thought that most people needed the gentle stimulus of meat and occasional alcohol, particularly as a medicine. Prudent indulgence in both was no dangerous vice. Yet this seemingly minor difference was actually a fundamental one, related to whether society was inherently pathological; did good health spring from keeping one's distance from society and tending to one's own internal economy, as the vegetarians alleged? Or, was society civilizing, as physicians held, and thus health came from integrating oneself more fully into it? This had an important bearing on nutrition as a social question, as it brought people's dietary habits into line with the broader health of society. If everyone ought to tend to their own needs without reference to the health of others, nutrition could not be seen as a social question; there would not be the need for a single mode of diet that would ensure the health of all.

Heeding Nature's Call

American medicine had very few barriers to entry for white men in the early nineteenth century, and the open scientific culture meant that anyone with access to books and personal experience could claim expertise based on their own interpretations of scientific ideas. Graham was a beneficiary of this openness. In his public lectures, given throughout the 1830s, and his 1,200-page, two-volume work, *Lectures on the Science of Human Life* (1839), he espoused an internally coherent theory of regimen that required a person to avoid stimulation of all kinds: meat, alcohol, spices, sex, heightened emotions, and participation in society. True health for Graham meant tending to one's own bodily needs without recourse to the broader social values; instead, one needed to

protect oneself from harmful outside influences. Graham formulated this theory based on his reading of medical texts, particularly the American physician Benjamin Rush, the French pathologist François Broussais, and the French anatomist and pathologist Marie François Xavier Bichat. What Graham took from his reading was that all ailments had their cause in the inflammation of the digestive tract.[56] This view exemplified the extreme of a broader medical consensus that many diseases had their seat in the gut. Physicians knew that disturbances in the stomach could cause system-wide problems, generating ailments elsewhere in the body.[57] Yet the doctrine of irritation was unique in that it attributed all illness to one primordial cause: an irritation in the gastrointestinal system that could not be understood with reference to anatomy but was instead a mysterious force, floating freely throughout the body.[58]

The great law of irritation was the central principle of Graham's system. The health of the body was governed by fixed laws, ordained by God and invariable; Graham likened these laws to the ones that govern the heavens, as discerned by astronomy.[59] While other commentators on diet and health might describe the rules of health as law-like, they understood that each person's constitution might be different and so the exact regimen for health might vary according to personal circumstance. Graham's system, by contrast, was strikingly modern in its fixity. According to Graham's view of the laws of the body, the central guarantor of a person's health was the proper functioning of the nerves at the pit of the stomach, which was the "great, primary, and common

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[56] Nissenbaum, *Sex, Diet, and Debility in Jacksonian America*, 57–60.

[57] Ian Miller, *A Modern History of the Stomach: Gastric Illness, Medicine, and British Society, 1800-1950*, Studies for the Society for the Social History of Medicine, no. 4 (London: Pickering & Chatto, 2011), 11–13.

[58] Elizabeth A. Williams, *The Physical and the Moral: Anthropology, Physiology, and Philosophical Medicine in France, 1750–1850* (Cambridge: Cambridge University Press, 1994), 168.

[59] Graham, *Lectures on the Science of Human Life,* vol. 1, 18–19.

center of organic life."[60] These nerves directed the system's requirements for air and food. They acted without recourse to the conscious will of a person, just as all organs in a healthy person functioned without thought. The nerves of the stomach further had relations with other, smaller clusters of nerves in the other organs. If the stomach was disturbed, say, by eating "substances which are not adapted to the wants of the vital economy," like meat or alcohol, waves of irritation would radiate out to the other organs of the body, leading to disease in those areas.[61] Further, if disturbances of the mind—such as stress or mental exertion—upset the functioning of the stomach, a general morbid irritability could render the nervous system extremely excitable and prone to illness. Such was the state of New England man in 1830s America: his simple, natural desires had been distorted by the artificiality of society so that dangerous stimulants like meat, spices, and alcohol were indulged in to suit the depraved tastes he had developed. Even worse, New Englanders ingested twice the amount of food that was needed by the animal economy. Following the laws of health meant cutting back, as well as eating only the least stimulating foods: vegetables and grains. It also mandated bathing in cold water and maintaining sexual abstinence. Avoiding these stimuli would calm the nerves at the pit of the stomach and diminish the stresses of life.[62] Nissenbaum reads Graham's regimen as a response to the particular anxieties of the Jacksonian era, as it provided a remedy for people who had fallen ill due to their reliance on a corrupt society and the capitalist economy. His dietetic prescriptions were therefore the route for a retreat from society. The harried businessman of the 1830s could find relief from his worries by pulling back from active life, washing in cold water, sitting down, and slowly chewing a hard biscuit.[63]

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[60] Ibid., 180–81.

[61] Ibid., 350–52.

[62] Ibid., 195.

[63] Nissenbaum, *Sex, Diet, and Debility in Jacksonian America,* 28.

For Graham, the function of the body, as defined by labor, was an important factor in understanding how much food a person should eat. Here is one point in common with Bell and other thinkers on diet in the period who stressed the relationship of food to labor. However, Graham did not think that one should eat for maximum fitness for work. He advised that ideally, a man should labor for only four hours a day, and that work should be primarily agricultural, as the cultivation of the soil was "beyond all question the natural employment of man."[64] Four hours of healthful outdoor work would invigorate the system and keep it "fitted for usefulness and enjoyment," not for maximum profit. But in the contemporary state of affairs, there was a mass of people who worked very little, and another mass who were compelled to labor too much, which depleted the vital force of the body and shortened the life span. Graham's working-class audience might identify himself with the latter camp, and for them Graham had soothing news. People who worked too much might still enjoy good health and cheerfulness even if their lives were shorter, for work ensured health, and it was better to have a vigorous life of fifty years than a miserable and debilitated one of eighty years. "Let not the laborer envy the drone," Graham remarked.[65]

Taking just enough exercise to make sure that the vital economy was neither too lax nor overtaxed was one way to live according to the laws of health. A further way was to heed the structure of the human body and the bodies of non-human primates, which contained hints about the natural dietetic character of man. For Graham, comparative anatomy was the means of understanding human nature, and he compared the morphologies of the skull, jaw, and teeth of humans to that of vegetarian non-human primates to argue for the naturalness of a diet devoid of

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[64] Sylvester Graham, *Lectures on the Science of Human Life*, vol. 2 (Boston: Marsh, Capen, Lyon and Webb, 1839), 654, https://collections.nlm.nih.gov/catalog/nlm:nlmuid-61411880R-mvset.

[65] Ibid., 655.

meat and other stimulants.[66] Non-human primates were the closest that people of the 1830s could get to understanding original man in a state of nature. Graham dismissed efforts by comparative anatomists to compare the corner teeth of the human jaw with the sharp cuspids of carnivorous animals, which were fit only to tear the flesh of prey and swallow it whole; this was not a human practice. It made more sense to compare human teeth with the grinding molars of herbivores. Notably, the teeth and jaws of orangutans were the closest to that of man. In a "perfectly pure state of nature, when left free to choose their own nourishment and follow their undepraved instincts," these animals ate only fruit, Graham enthused.[67] People could induce orangutans to eat flesh in captivity, however. While some observers had argued that the fact that they would occasionally eat meat meant that they were omnivorous, Graham contended this argument was a "monstrous absurdity," because it confused corruption by society with natural instincts. Further, it assumed that "God has constituted an animal with certain alimentary wants and endowed it with corresponding instincts, without giving it the necessary mental and voluntary powers to obey those instincts and supply those wants," he wrote.[68]

In his discussion of the diet of orangutans and his evocation of "state of nature," Graham did not directly reference Jean-Jacques Rousseau, though his use of these concepts evinced a debt to the French philosopher. For Rousseau, man was originally in a state of nature, where he was solitary and happy. Once people began to live together for protection, they formed societies, the avenue though which society formed and corruption began to seep into human nature. To understand people's true nature, one had to reconstruct original man; all that we can know about human nature

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[66] It is possible that Graham had an opportunity to see an orangutan himself or read about it in the local medical literature, as a captive one was in Philadelphia in 1836. "Description of an Hermaphrodite Orang-Outang Lately Living in Philadelphia," *The Lancet* 25 no. 655 (1836): 963-965.

[67] Sylvester Graham, *Lectures on the Science of Human Life*, vol. 2, 68.

[68] Ibid.

must come from separating out what was artificial from what was natural, with the natural being the most purely and correctly human.[69] As with Graham, Rousseau's designation of vegetarian food as the natural diet of man stemmed from the fact that he thought man uncorrupted by society would be innocent of violence, and therefore eschew meat.[70] The fact that even uncivilized men killed for food was proof for Rousseau that people everywhere had irrevocably left the state of nature. Likewise, Graham thought that no men were presently in a state of nature, as one could plainly see by their diet, which was "so artificial that there is nothing about them that could be considered as part of the natural dietetic character of man." Further, all societies were so corrupt that "so far as [nutrition] is anatomically considered, man must in strict propriety be regarded as an extinct species."[71] If original man had died out, there was at least a process of repair for his enervated descendants. Unlike Rousseau, Graham offered his own system as a means for contemporary people to evoke the natural wholeness of man and create a contemporary simulacrum of the original state of nature. Brown bread, cold water, and fresh fruit were the foods of innocence, and recovering that innocence was the only means for obtaining pure and natural health.

Graham's exemplar of the untainted appetite was the wild boy Caspar Hauser. Hauser was a German 17-year-old who had appeared in Nuremberg in 1828. The boy said he had been imprisoned in a cellar from as far back as he could remember, and while he had received bread and water from an unknown, unseen caretaker, he had little social stimulation and so could only speak a few words. Hauser's appearance was an international sensation, with his story reported by the press worldwide. Graham's portrayal of Hauser as an anachronistic, original man went along with the

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[69] Francis Moran, "Between Primates and Primitives: Natural Man as the Missing Link in Rousseau's Second Discourse," *Journal of the History of Ideas* 54, no. 1 (1993): 37–58.

[70] Jean-Jacques Rousseau, *The Discourses and Other Early Political Writings*, (Cambridge: Cambridge University Press, 1997), 193–94.

[71] Graham, *Lectures on the Science of Human Life,* vol. 2, 51.

popular literature on the boy, which portrayed him as an innocent victim of the powerful and an avatar of naturalness.[72] Usefully for Graham's perspective, Hauser was particularly noted for having a very acute sense of smell and taste, to the extent that that new foods were revolting to him, particularly any kind of meat, milk, alcohol, coffee, or heavily spiced dishes. Owing to Hauser's concurrence with his own dietetic strictures, Graham saw in the wild boy the epitome of the untainted, natural appetite, reared healthily on bread and water and kept from the debilitating effects of civilization. "Caspar's extraordinary acuteness and power of hearing were in no degree the effect of cultivation, but depended entirely on the pure, natural sensibilities of his organs: or on the very great degree of natural and healthy sensory power of his nervous system," Graham wrote in the *Science of Human Life.*[73] As Hauser became accustomed to life outside of a basement the acuteness of his senses diminished, which Graham argued was due to the enervating effects of meat consumption and exposure to unnatural and overstimulating society. In Graham's view, health sprung from cultivating a separateness from the world and a calmness of affect that verged on inertia, and thus Hauser was the exemplar of the healthy life.[74] Health, therefore, would come from retreat. If it was impossible for the excitable person of the 1830s to achieve the heights of health of Caspar Hauser, he could at least reject meat and society alike in order to regain some of what had been lost.

Graham's vision of the modern body, therefore, was one that had degenerated from the pinnacle of health, but could be restored if a placid mind, nerves, and stomach were maintained by gentle, solitary labor and a calming diet. God had designed human beings as a perfect economy, with fixed relations among the physical, moral, and mental faculties. This bodily economy would remain

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[72] Martin Kitchen, *Kaspar Hauser: Europe's Child* (New York: Palgrave, 2001), 179.

[73] Graham, *Lectures on the Science of Human Life,* vol. 2, 298.

[74] Nissenbaum, *Sex, Diet, and Debility in Jacksonian America,* 133–34.

unblemished if all of the laws of health were obeyed. Errors in regimen, the debilitating effects of contemporary life, or external, disease-causing agents, were like the foreign enemies that could assail a state, Graham wrote. In Graham's view of the social organism, the body's organs were akin to the "husbandman, and artisan and merchant, and other members of the commonwealth," who would be roused to fight for the good of their nation during an invasion.[75] This metaphor, which notably lacked any sort of governance that might direct the action of the organs/citizens, contained the seeds of Graham's populism, with its emphasis on the inherent virtue and sound instincts of the common man in the absence of government. Notably, however, Graham's vision of the body as a state countenanced no alliances, nor the possibility of a confederation of nations. Each person must tend to his own bodily economy alone, without reference to the society in which he lived. If society was artificial, and therefore only a source of corruption, natural health could only be attained by maintaining distance from one's fellows.

Luther Bell's Dietetic Whiggery

Opposing Graham's vision of health through social isolation was a vision of the body made better by social interaction, and this was Bell's perspective. His ideas were shaped by his membership in the Whig Party. As the historian Daniel Walker Howe has noted, a notable strain within the intellectual culture of the antebellum United States was the ideals and beliefs of the Whig Party. While the party itself was less successful in politics than its Democratic opponents, it exerted an outsized influence on the cultural and intellectual life of the country. The Whigs were largely New England men, often of the upper classes, and devoted to improvement and national development. In politics, this meant a strong, authoritative central government: federal support for infrastructure projects, a national bank to regulate the currency, and tariffs to protect domestic industry. In social

[75] Graham, *Lectures on the Science of Human Life,* vol. 2, 137–38.

matters, Whigs were associated with temperance, public education, antislavery agitation, and missionary activities of all stripes. Despite the varied projects of individual Whigs, what held the party together was this appeal to the morals of the middle classes, and the stress put on the need for all in society to work for a better country. The underlying vision of society for Whigs was analogous to that of a body in perfect balance, with his passions under proper control and reason directing the action of the system. As Howe writes, a central part of the Whig social organism was "the parallel between regulating the faculties within an individual and regulating the individuals within society."[76]

Just as a person had to assert his will over his body with the proper regimen, so too did a strong central government need to control the activities of the economy and of the people. A person who didn't regulate his passions was just the same as a country in the grip of laissez-faire social policy, which left unmanned the vital responsibilities of the state. Howe quotes a Whig newspaper declaiming that "no deeper degradation of the soul can be conceived than the complete mastery of Man by a base appetite," and disordered eating was a sign of a base appetite indeed. Whig moral philosophy held that a man was only free when he could follow the dictates of his reason and conscience. Otherwise, he was a literal slave to his lower nature.[77] As any passion left ungoverned might conceivably lead to moral ruin, it followed that a vegetarian mania, such as the one promulgated by Graham and his followers, was a dangerous enough threat to order and good sense to warrant a correction from men who thought they knew better.

Seen in this light, Bell's essay was a Whiggish line deliberately drawn in the sand against Graham and his followers, and it follows that it won the Boylston Prize. The award had been endowed by Ward Nicholas Boylston, who had given a sum of money for the purpose.[78] The prize

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[76] Daniel Walker Howe, *The Political Culture of the American Whigs* (Chicago: University of Chicago Press, 1979), 29.

[77] Ibid., 30.

[78] "Editorials and Medical Intelligence," *Boston Medical and Surgical Journal* 13, no. 5–6 (September 16, 1835): 95–99.

committee included physicians like George Cheyne Shattuck and Jacob Bigelow, physicians and well-known public men. The question for 1835 was "What diet can be selected which will ensure the greatest probable health and strength to the laborer in the climate of New England? Quantity and quality, and the time and manner of taking it, to be considered."[79] Bell's winning essay answering this question was published in the *Journal* and subsequently printed as a book of advice for New England laborers in 1836. While Bell did not mention Graham by name, his essay was intended to be a shot across the bow of the vegetarian reformer. Bell noted in the essay that his words might "be deemed discourteous" toward a certain Massachusetts proponent of the vegetable diet, considering the essay was written to falsify all of the man's claims. While Bell politely begged Graham's indulgence, he did not pull his punches.

Bell's family background and education exemplified his orientation toward defending established society and his interest in putting his medical knowledge in the service of social improvement. Luther V. Bell was born in New Hampshire in 1806, of Irish Presbyterian ancestry. The men of his family were professional men, physicians and lawyers as well as politicians; his father had been the governor of New Hampshire. Bell entered Bowdoin College at the age of 12, and commenced a medical apprenticeship under his brother John at the age of 16. The education that Bell received was likely imbued with the moral philosophy taught in American colleges in the period, which knit together metaphysics, religion, and the study of politics and political philosophy. Stemming from eighteenth-century common sense philosophy, it posited that the external world was knowable and objective; God made common sense as a tool for people to use, and therefore men could trust what they see and understand nature.[80] These were ideas that Bell took as watchwords for

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[79] "Editorials and Medical Intelligence," *Boston Medical and Surgical Journal* November 11, 1835.

[80] Gerald N. Grob, *Edward Jarvis and the Medical World of Nineteenth-Century America* (Knoxville: University of Tennessee Press, 1978), 15; Dorothy Ross, *The Origins of American Social Science*, Ideas in Context No. 19 (Cambridge: Cambridge University Press, 1990), 36.

the rest of his life. After his general schooling, Bell received his medical degree from Dartmouth College in 1826. He was then 19 years old. He felt he was too young to begin practicing medicine, so he spent a year working at a counting house in New York owned by his brother-in-law. He returned to New Hampshire to set up a medical practice in 1831.[81] In 1835, when Bell won the Boylston prize, he was both a country practitioner and a statesman, serving in the New Hampshire state legislature. In this latter post he was on a committee investigating the status of the insane in the state, and he pushed for New Hampshire to found an insane asylum. His efforts on behalf of the insane in his home state caught the attention of the trustees of McLean Hospital in Waverly, Massachusetts, and in 1837 he was invited to become that institution's medical superintendent. He held the post for the next eighteen years. Bell was instrumental in the transition of McLean toward becoming an institution for an "improved class of sufferers," as he put it: genteel, well-off patients whose families could afford its high fees. Bell was also one of the founders of the Association of Medical Superintendents of American Institutions for the Insane in 1844, which was the first medical specialty organization in the US In 1853 he was appointed by a board of commissioners for examining convicts in the Massachusetts penitentiary who exhibited signs of mental disease, and additionally advised the governor in clemency cases for the criminally insane.

Bell continued to involve himself in Whig politics after he moved to Massachusetts. He clung to the party even as it fractured in the 1850s over tensions about slavery and competition from newly-formed political parties, including the Republicans. Bell ran for Congress and for the governor of Massachusetts on the Whig ticket, but lost both races by a large margin. By 1855, he retired from McLean due to poor health and to family tragedy. He suffered from lung and heart trouble, and worse, his wife and three of his children had died in previous years. He moved himself

[81] George Edward Ellis, *Memoir of Luther V. Bell, M.D., LL. D.: Prepared by Vote of the Massachusetts Historical Society* (J. Wilson and Son, 1863); S.B. Sutton, *Crossroads in Psychiatry: A History of the McLean Hospital* (Washington, DC: American Psychiatric Press, 1986), 58.

and his four remaining children to Charlestown, Massachusetts within sight of the asylum. He spent his time in the more leisurely occupation of consulting with other physicians and testifying at trials as an expert witness in cases of the criminally insane. When the Civil War broke out in 1861, Bell signed on as a regimental surgeon with the Eleventh Regiment of Massachusetts Volunteers. Despite his poor health and his dependent children, Bell "felt that in the impending conflict no man should be idle," as his eulogist put it. While he rose in the ranks of the Army Medical Department, his health remained poor, and he died of pericarditis in 1862 while in the field.[82]

Bell's ideas about the proper care of mental patients were in line with his political beliefs. Moral treatment, the system that Bell put into place at McLean,, was a means of applying rational, orderly structures to the treatment of the insane, on the grounds that a person could not heal from mental illness in uncomfortable or unpleasant surroundings. On his watch, treatment emphasized moral suasion over restraints and medication. He abolished work requirements for his well-heeled patients on the grounds that they should not dirty their hands with manual labor. He further emphasized the conditions of the patients' confinement over medical treatments for insanity. This meant lessening the number of medical interventions they underwent and instead ensuring decent food, as well as recreational and occupational therapy, in the hopes that moral treatment would help effect a cure of the patients' mental illness. This notion ran in parallel with the idea of centralized, rational governance in Whig ideology. As the moral treatment of the insane emphasized proper management over the administration of medicines, the construction of an asylum building and grounds was the most important part of a medical superintendent's job. Thanks to Bell's renovation efforts, McLean had central heating, carpets, open fireplaces, elegant furniture, and mirrors, and a

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[82] Isaac Ray, *A Discourse on the Life and Character of Dr. Luther V. Bell : Read to the Association of Superintendents of North American Institutions for the Insane, at Its Annual Meeting, in Providence, R.I., June 10th, 1862* (Boston : J.H. Eastburn's Press, 1863), 21, http://archive.org/details/9609410.nlm.nih.gov.

pleasant setting that would be likely to produce calm in the disturbed men and women who lived within the hospital's walls.

That being said, Bell did not think that nicely appointed quarters ought to be solely the province of the wealthy insane. A well-regulated, soothing asylum could not be had on the cheap, even for paupers. If the patients themselves could not pay for their treatment, the state ought to provide. "The tax-paying community must be trained to understand and admit the necessity of expensive arrangements" if the patients in an asylum were to be cured rather than merely warehoused, Bell wrote, in describing his design for a new asylum in Rhode Island in the late 1840s.[83] His call sounded the same notes as the prison and asylum reformer Dorothea Dix, who was Bell's friend and took McLean to be a model hospital for the insane.[84] Likewise, the order of the building would have to be maintained by the asylum's staff, with their own conduct as the first example. In his rules and directions for the attendants at McLean, Bell wrote that the officers of the institution were to regulate their persons and emotions in order in order to help their charges. The orderlies would have to keep their clothes and bodies clean, and to behave with decorum: to not to mock the patients or reason with them, but instead to treat patients kindly and speak to them in a gentle tone of voice.[85] The maintenance of salutary order was the crucial factor in effecting a cure for the mentally disturbed of McLean under Bell's tenure as its medical superintendent.

Bell's views about politics, medicine, and diet were all of a piece: proper governance, healing, and self-management entailed close attention to all the aspects of the social or bodily system to ensure that they were working properly. The central thrust of his 1835 essay on the diet of the workers of New England was to offer an alternative to the Graham system, using his medical

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[83] Luther V. Bell, *Design for the "Butler Hospital for the Insane" at Providence, Rhode Island* ([R.I.], 1848), http://galenet.galegroup.com.ezproxy.library.wisc.edu/servlet/Sabin?af=RN&ae=CY3807717492&srchtp=a&ste=14.

[84] Sutton, *Crossroads in Psychiatry,* 82.

[85] Luther V. Bell, *Rules and Directions for the Attendants at the McLean Asylum for the Insane* (Boston: Kidder and Wright, 1839).

authority to put the working class on the path of proper dietary guidance and bodily management. This view took as a given that the New England worker was a rational and trustworthy individual, amenable to changing his views when presented with the right course of action, but perhaps slightly prone to being seduced toward wayward behavior by radical preachers. Diet was important, Bell wrote, as it affected people's intellectual and moral existence. Bell noted that it was the "generally received opinion" that the intellectual and moral faculties were dependent on the physical organs of the body, therefore a correct diet was needed to keep the mind and body functioning properly.[86] This was fairly standard medical advice, and of course was also shared by Graham. What was distinctive about Bell's discussion of diet was his insistence that it affected people's civil and political relations as well.

Bell explained the connection between diet and political economy by noting that political economists considering the question of population were beginning to think of man as a "laboring animal" and therefore the question of the public's diet was an essential one for understanding the economy of a country. Bell was referring to Thomas Malthus's theory of population, which posited that famine would result if the growth in a country's population outstripped its food supply. Bell did not address the question of the relationship between population and available resources. Nor did he think of connecting the productive power of New England workers with their diet. Instead, he noted that taking political economy into account caused physicians to shift the focus of their dietary advice. Physicians had previously only considered the leisured classes, primarily because they had been up to this point the main consumers of diet advice. Wealthy people had both the luxury to choose their foods and tended to corpulence due to overindulgence. Bell noted that this shift toward studying the nutrition of laborers as an odd choice on the surface, as the working class were far less

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[86] Luther V. Bell, *A Dissertation on the Boylston Prize-Question for 1835: What Diet Can Be Selected Which Will Ensure the Greatest Probable Health and Strength to the Laborer in the Climate of New England?—Quantity and Quality, and the Time and Manner of Taking It, to Be Considered* (Boston: D. Clapp, Jr., 1836).

liable to committing errors in diet. They tended to be engaged in exercise and lacked the surplus money that would allow them to stuff themselves on luxuries, and so were healthfully constrained in their choices and liable to work off any excess food. Beyond political economy, the effects of diet faddists were causing doctors to think anew about the diet of the workers as a problem. Graham and other popular lecturers on diet, who brought out "some fact and much fancy," Bell wrote, had made it clear to the workers of the country that even they feed themselves incorrectly.[87] Therefore it was necessary for physicians like Bell to take up the issue and furnish the proper facts.

Bell traced the origin of Graham's dietetic faddism to the temperance movement. Like many doctors, Bell was a temperance man himself, so he had nothing but praise for the movement, which he cast as a means of bringing people into better habits of self-governance. The temperance movement had brought about an "extraordinary and truly unparalleled change" in the daily habits of Americans, Bell wrote.[88] It brought to workers' notice that they were committing errors in their diet by drinking alcohol, problems which they were heretofore completely unaware; it also caused physicians to consider the effects on the body of stimulants like alcohol. Drawing popular attention to the evils of drinking was an unalloyed good, Bell thought, and one that stemmed from sound science. Bell had been the president of a New Hampshire temperance organization, and in that post he advocated total abstinence from all types of alcohol.[89] However, he thought that temperance advocates went too far when they included meat among the roster of dangerous stimulants. Bell argued that seeing meat as a threat to health was fundamentally erroneous, as stimulants had their use in the body as a means to support the body's health in cold climates, or under hard labor.[90]

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[87] Bell, *A Dissertation on the Boylston Prize-Question for 1835,* 4.

[88] Ibid., 6; Osborn, *Rum Maniacs,* 6.

[89] Bell, "An Address Before the Young Men's Entire Abstinence Association," 7.

[90] Bell, *A Dissertation on the Boylston Prize-Question for 1835,* 7.

The notion that workers should understand the reasons behind dietetic strictures was a central thrust of Bell's essay. Bell used science in his essay to give authoritative weight to his ideas and to make his essay more broadly educational, and not as a way to suggest that science was the chief authority in nutrition, as would increasingly be the case in later decades of the nineteenth century. Bell took up Graham's contention that the teeth and jaw of non-human primates offered the best guide to the diet of man in a state of nature. He sought to complicate the idea that the teeth offered a clear indication of what sort of food a creature ought to eat. While he agreed with the general view of comparative anatomists that the teeth, jaws, and alimentary canals of animals were suited to the kind of food they eat, Bell thought that this information was insufficient for making any solid conclusions about the natural dietetic character of man. He noted that while Georges Cuvier, William Lawrence, Johann Friedrich Blumenbach, and other comparative anatomists had remarked upon the similarity of humans to fruit-eating, non-human primates. It was a mistake to assume that man was omnivorous based on this similarity. The analogy of form of humans' teeth, jaws, and digestive tract to that of apes only could prove that humans could eat food that had a similar consistency to soft, ripe fruit. All human societies ate both animal and vegetable food in a prepared state; cooked or otherwise refined to make it soft enough to chew and digest. Man was designed "to be governed in his food as in everything else, not be instinct, but by his reasoning faculties," Bell wrote, which allowed him to "subdue nature to himself," furnishing food, clothing, and shelter.[91] Therefore there was no need to assume that only sharp-toothed carnivores could eat meat; man could chew cooked meat with his herbivore jaw.

Graham's evocation of a close kinship between man and apes was particularly risible to Bell. He rejected the notion that non-human primates exemplified some sort of missing link between contemporary human beings and the rest of the animal kingdom. Bell argued that humans, no

[91] Ibid., 7–12.

matter if they were in a civilized or uncivilized state, constituted "a species *sui generis,* far removed from all others," and the fruits of civilization were the result of physical and moral improvement.[92] As historian Dorothy Ross has noted, Democrats "developed the rhetoric of nature; the Whigs stressed the importance of historical institutions and the value of education against the potentially radical claims of natural rights."[93] The notion of nature versus culture that lay beneath political debates in 1830s America were also present in debates about diet. In making his argument in favor of the importance of culture in maintaining health, Bell drew on the lectures on physiology and the natural history of man by the English surgeon William Lawrence. Lawrence noted the differences between man and animals, particularly humans' long infancy and the fact that all people across the globe live in societies. Both traits lifted human nature above that of animals. Social life and progressive civilization, Lawrence wrote, were "very valuable parts of his nature, as much as the erect stature and speech." Humans would not be human if they lacked social intercourse, civilization, and language, and so it made no sense to assume that there had existed men in a state of nature, let alone to posit that a vegetarian diet was the proper food of natural man.[94]

Therefore, Graham's contention that a feral child should exemplify the height of salutary living was nothing but a provocation to a Whig like Bell. For Whigs, a strong connection to one's society and a continual striving for betterment were the cornerstones of a life well lived. A person who was without any sort of social instruction was practically irredeemable. Bell devoted a notable part of his essay on diet to describing and analyzing the life of "Wild Bill, or the Mississippi Orson"

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[92] Ibid., 13.

[93] Dorothy Ross, *The Origins of American Social Science*, 35.

[94] Sir William Lawrence, *Lectures on Comparative Anatomy, Physiology, Zoology, and the Natural History of Man* (London: Henry G. Bohn, 1848), 184, 197.

a white boy who had been found naked and alone in the Mississippi wilderness.[95] Bell reprinted an article from the *Knickerbocker* about this boy, who had lived alone in a Mississippi swamp until he was found by settlers in 1811. When he was discovered, the child was about nine years old, and had survived by hunting frogs and small animals and devouring them raw. He ran from the men who first encountered him; the men captured the child by hunting him down with dogs. Unlike Caspar Hauser, who had the benefit of a careful education once he was found, Wild Bill had been thrown among a rough frontier people who were unwilling to teach him the nuances of social life or to place him in school. "In a forest full of Indians and wild animals, Wild Bill was an object of very little higher interest than a tamed bear or panther," for his neighbors, the article noted. As he was poorly educated and hardly civilized, Wild Bill exemplified the qualities of his name even after he had lived among people for some years. He could barely talk, had a fierce and violent temper, and hated to wear clothing and to work. He retained his preference for uncooked meat, and developed a passion for liquor, especially when it was sweetened. Thus his appetite remained savage and untutored, with a strong preference for stimulating foods like meat and alcohol; a far cry from the notion that the natural man was naturally vegetarian.[96]

Bell argued that Wild Bill more closely approximated the "homo naturæ" than Caspar Hauser did, as the German child had been clothed, fed, and kept indoors during his period of isolation and therefore had some human care. The fact that Hauser was repulsed by meat was simply a result of being raised on a vegetable diet, not a sign of the instinctive inclinations of the innocent palate. Bell argued that "natural tastes" did not exist; the conventional customs of any society shaped preferences to the point where there would be no distinguishing between a person's natural

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[95] The name "Orson" in the title of the article referred to the medieval romance, *Valentine and Orson,* about twin brothers abandoned in the wilderness in infancy. Valentine is found and raised as a knight; he eventually locates his brother, Orson, a wild man in the woods, and tames him.

[96] Bell, *A Dissertation on the Boylston Prize-Question for 1835,* 20–23.

appetite and his acquired taste. As a Whig and a firm believer in the civilizing power of reason, the idea of natural man was particularly risible to Bell. Though Graham elided reference to Rousseau, Bell attacked the French philosopher head on; he equated Grahamism with Rousseau's notion that man living in a state of nature was fundamentally good, until he was corrupted by culture. In Bell's view, this was a false understanding of nature. A person left alone in the world would be more like Wild Bill: savage, brutish, and incapable of discrimination. Raw, unrefined qualities in the natural world and in human beings must be purified through reason and education (as well as science and commerce) in order to be good. Likewise, man needed to work to make all of his habits compatible with both the society he lived in and the best advice from physicians of authority to maintain his moral and physiological balance.

Neither comparative anatomy nor the appetites of wild men provided a guide to diet, in part because the body's health was not thought to be self-contained or internally determined in the medical world of the 1830s. Health was linked closely to climate and topography, through the discipline of medical geography, one of the preeminent medical sciences of the early to mid-nineteenth century.[97] The idea that the body's health was dependent on its surroundings could be extended to nutrition: the right kind of food for a person or race was influenced by climate. Those in southern, hotter climes ate primarily fruits and vegetables, as the body had to work comparatively lightly to supply work and warmth. By contrast, people in frigid, demanding Polar regions ate exclusively meat in order to provide strength for the body's exertions. New England rested in the temperate belt of the globe, where people ate a mixed diet of meat and vegetables. The moderate stimulus of animal flesh helped the New England laborer survive in a cold climate, but as the weather was not so cold as regions farther north, not too much meat was needed.

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[97] Ronald L. Numbers, "Medical Science Before Scientific Medicine: Reflections on the History of Medical Geography," *Medical History* 44, supplement S20 (January, 2000): 217–220.

Bell's focus on the fit between man and his environment caused him to pinpoint the one dietary error that New Englanders tended to commit: overeating to the point of gross excess. Bell noted that European travelers to New England reported being repulsed by the people's gluttony. New Englanders were famed for a diet consisting of great slabs of greasy pastry and heaps of ill-cooked meat served in a lake of melted butter or lard, all consumed with great dispatch and washed down with gallons of tea, coffee, and alcohol. The primary reason for why overeating was a problem was not incipient obesity. Eating too much disrupted the balance between the supply of food and the body's demand for it. When in proper balance with the environment, the body was part of a stable system. Eating too much or too little disturbed this system. Of course this statement was tempered by the fact that each person might have slightly different alimentary requirements, but Bell felt comfortable in advising most New Englanders to eat less. In particular, the people of the region could stand to eat less meat. The stimulating qualities of meat ingested in excess over-excited the system, to the point where a New Englander's stomach could be enfeebled by his own habits, overwhelmed by too much concentrated nutrient. "After a full meal of animal food," Bell wrote, "the action of the heart is soon materially increased, the brain is oppressed ... a general disturbance of the constitutional powers is manifested." [98] Likewise, the ease with which New Englanders obtained alcoholic drinks and the avidity with which they consumed them was a particular cause for worry. The overuse of meat and alcohol contributed to the fact that Americans suffered from diseases of "excited action" which required a host of depleting medical treatments like bleeding and purgatives to lower the system and keep it in check.

Interestingly, Bell had a low opinion of chemistry as a means for determining the right amount of food needed by individuals. Though Bell does not reference these developments in his

[98] Bell, *A Dissertation on the Boylston Prize-Question for 1835,* 30.

essay, he may have heard of Francois Magendie's attempts in the 1830s to determine if gelatin was nutritious, or William Prout's classification of foodstuffs into sugar, fat, and albumen.[99] Nevertheless, efforts by European chemists to determine the exact quantity of food needed by a person were "the height of absurdity," Bell wrote, as the requirements for food differed for everyone in relation to their physical activity and body shape and size, just as the pulse, physical stature, and quantity of air respired varied in the population.[100] Instead of prescribing set amounts of food he cited the eighteenth-century doctor George Cheyne's opinion that one should eat the least amount of food that a person could be "tolerably easy under," i.e., to eat until one just barely reached the point of satiety, to avoid ingesting more than the system could digest and assimilate. At mealtimes, one should push the plate away "at the first sensation of having taken enough," Bell wrote. Laboring men should avoid excessive variety in the diet to not tax the stomach with too many mixtures. To lessen the burden on the stomach, one should eat meat at only dinner, rather than for all three meals, as was the American habit. Plenty of vegetables should be eaten alongside the meat, which would mix in indigestible fiber into the food and lighten the mass, making a meal easier to assimilate.[101] One's food should also be eaten slowly, in order to savor the meal and be aware of the sensation of fullness as it develops. Bell compared the southern European's habit of lingering over a light dinner of bread and grapes to the Yankee's industrious approach to mealtimes. While the European allowed himself ample time to digest his scanty meals, the New Englander "encountered

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[99] Frederic Lawrence Holmes, *Claude Bernard and Animal Chemistry: The Emergence of a Scientist* (Harvard University Press, 1974), 6–12; Elmer Verner McCollum, *A History of Nutrition; the Sequence of Ideas in Nutrition Investigations* (Boston: Houghton Mifflin, 1957), 88.

[100] Ibid., 34.

[101] Ibid., 30–31.

his dinner as he would any other necessary work which had to be accomplished," and wolfed down his food with avidity, eating far more than he needed.[102]

Instead of chemistry, Bell's advice for New England workers was based on physiology. His perception of the stomachs' irritability in the presence of the wrong kind of food was indebted to the recently published experiments of William Beaumont on Alexis St. Martin. Beaumont had treated St. Martin for a fistula that opened in the man's stomach by an imperfectly healed gunshot wound. In 1823, Beaumont realized that he could introduce food into the opening, which gave him a unique opportunity to observe the process of digestion. Over the course of a decade of experimentation, Beaumont would lower morsels of food, tied on a string, into St. Martin's stomach and time how long they took to dissolve. He also extracted samples of the gastric juice for chemical analysis.[103] Beaumont's work was rapidly integrated into popular writings on diet and health, particularly his work on how fast certain foods could be dissolved by the gastric juices. Speedy digestion became one of the major metrics for choosing the right kind of food. Fish and fowl were at the top of the hierarchy, as they were the most easily and completely digested. Fibrous or fatty material, like boiled cabbage, salt pork, and pastry and rich cakes, stayed in the stomach for what seemed like far too long and were therefore assumed to cause dyspepsia. Bell noted that Beaumont had found that the stomach could only secrete so much gastric juice at a time, so that all the food that was not digested remained in the stomach as a "foreign, irritating body" that could produce fever.[104] Foods that lingered in the stomach could even ferment, causing other gastric disturbances.[105]

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[102] Ibid., 38.

[103] Ronald L. Numbers, "William Beaumont and the Ethics of Human Experimentation," *Journal of the History of Biology* 12, no. 1 (April 1, 1979): 113–35; Jerome J. Bylebyl, "William Beaumont, Robley Dunglison, and the 'Philadelphia Physiologists,'" *Journal of the History of Medicine and Allied Sciences* 25, no. 1 (1970); 3–21; Ronald L. Numbers and William J. Orr, "William Beaumont's Reception at Home and Abroad," *Isis* 72, no. 4 (December 1, 1981): 590–612.

[104] Bell, *A Dissertation on the Boylston Prize-Question for 1835,* 33.

[105] John Hoskins Griscom, *Animal Mechanism and Physiology,* 314.

This was significant, as all authorities knew that the stomach was a sensitive organ, prone to upset in the case of overindulgence or eating the wrong kinds of foods.[106]

One would therefore assume that the New England laborer would become oppressed by his heavy, indigestible diet, but Bell did not think that diet was a major factor in the health of the region. Mortality records indicated that "the habits of the New Englander, as to diet, approximate *nearer* than those of any other people to the standard of correctness," Bell wrote.[107] He used figures published in the American *Medical Magazine* showing the rates of mortality of New England towns: on average, the annual death rate was about one in seventy or eighty people. He argued that this was a favorable comparison to Europe. Figures published by the French Academy of Medicine in 1833 showed that the annual death rate for European countries was higher than that in New England: France's mortality rate was 1 in 39, Germany's was 1 in 45 and England's was 1 in 58. Bell used these statistics to argue that the healthy diet of New England preserved people's health and lowered the region's mortality rate. Of course, death rates in Europe were not due solely to diet; Bell argued that other Malthusian circumstances, like overcrowding, burdensome taxation, and despotic government took their toll on the population. But diet did play a significant role in malnutrition among European nations. In poorer parts of Europe, Bell noted that vegetarianism resulted "from a necessity, the over-crowded state of the population, which brings man down to the minimum of food capable of sustaining existence."[108] By contrast, the excessive diet in the United States was no great drag on the health of the nation. Bell contended that the New England laborer was "pre-eminent in health and bodily capability" among the peoples of the world, because he always had an abundant supply of nourishing and wholesome food, his cookery was simple, and he was industrious, which prevented

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[106] Miller, *A Modern History of the Stomach,* 22.

[107] Emphasis in the original.

[108] Bell, *A Dissertation on the Boylston Prize-Question for 1835,* 16.

the effects of overfeeding being as injurious as it would if he were idle. Further, his intellectual and moral habits "keep a tone of cheerfulness and constant prospect of improvement in his comforts and situation" which helped maintain digestive health.[109] Therefore, instead of total abstinence from meat or other stimulants, temperance—or, better put, the educated appetite—had the most bearing on longevity, not the choice of aliment. Bell argued that a sense of moderation and restraint were the most important guides to diet for the New England workingman, particularly as no other reliable guide existed.

Taken as a whole, Bell's essay was a means to guide the workers of New England toward an education of the sensibilities, so a person may govern himself correctly according to the dictates of his society. Despite its stated aims, it seems likely that Bell's essay held more appeal for the educated classes than for its putative working class reader. While the essay was printed as a stand-alone book as well as in the pages of the *Boston Medical and Surgical Journal*, it likely didn't have a wide circulation. Its learned language, peppered with citations and phrases in Latin, would appeal more to the elite men on the Boylston Prize committee than to the average bricklayer. Further, Bell's essay needed to be read, rather than experienced; undoubtedly the wider popular awareness of Graham's ideas was due to his appealingly incendiary public speeches. More than an actual education for the working man, the Boylston prize-winning essay was a statement of orthodoxy and reassertion of control of the high ground on behalf of Whiggish physicians.

This control was not just about eating. Instead, it was about making sure that the body stayed in balance so that the mind may remain calm. Echoes of Graham's worries about overstimulation can be clearly heard in Bell's work, though for Bell meat and society were not the causes. The New Hampshire doctor noted that people who overtaxed their brain with mental labor tended to suffer from gastric disturbances, and that no amount of care in choosing the type and

[109] Ibid., 45.

quantity of their food could cure it.[110] In particular, excessive thought about diet could be the cause of disease itself, a problem to which diet faddists were particularly liable. As the *Boston Medical and Surgical Journal* editorialized, obsessing about one's food and drink, as vegetarians might be prone to do, "creates an irritation in the stomach, a constant sense of indigestion, a constant imaginary hunger" that gnawed away at equanimity and ruined one's mental health.[111]

Nature Bites Back

Further rounds of the argument between Graham and Bell in the pages of the *Boston Medical and Surgical Journal* clarified the debate as one that pitted nature against culture, freedom from social strictures against following social rules. Sylvester Graham fired off a retort to the *Journal* soon after the publication of Bell's essay, which the editors published immediately. Graham's essay was brash and boastful, and the thrust of his argument lay in refuting Bell's contention that reason trumped nature; on the contrary, Graham argued, man must use his reason to follow nature's laws. If the evidence from nature, like the shape of the human jaw and form of the teeth, showed that fruit and vegetables ought to be the natural food of man, then only bad health would result from attempting to eat meat and other artificial foods. "All departure from the constitutional laws of our nature," Graham wrote, "is always, and necessarily, attended with commensurate injury to our physiological interests."[112] Further, it was important to resort to evidence rather than relying on received wisdom, as Graham charged Bell with doing. Graham acknowledged that there was a natural propensity in man to "cling to established institutions, and to reverence heredity usages."[113] While this gave

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[110] Bell, *A Dissertation on the Boylston Prize-Question for 1835,* 35.

[111] "Some Remarks on Diet," *Boston Medical and Surgical Journal* 10 (March 19, 1834): 96–98.

[112] Sylvester Graham, "Remarks on Dr. Bell's Prize Essay," *Boston Medical and Surgical Journal* 13, no. 21 (December 30, 1835): 183.

[113] Ibid.

stability to society, it also perpetuated error of just the sort that Bell made when he declared the diet of New England one of the healthiest available. What was needed instead was to go among the people, collect the evidence available, and seek the truth, just as Graham had done. If one were to do so, he would come up with just the same conclusions that Graham arrived at.

Graham peppered his essay with insults to Bell and to any who might criticize his system, crowing that if he were to air all of his evidence in the journal, not only would it be necessary to take up all of the publication's pages it would also "excoriate [Bell] from head to foot" and he had pity for the young, deluded doctor. If Graham had hoped to overcome the publication's editors and readers by force of bluster he was mistaken. The flurry of essays that the *Journal* published in its wake roundly mocked Graham and his pretensions to scientific authority.[114] They particularly dismissed as risible Graham's claim that he had studied the relations between body and mind so thoroughly that no further research was needed, or even possible.[115] Of course, Graham's core constituency was not orthodox physicians like the readers of the *Boston Medical and Surgical Journal,* but the mass of people in New England whom both sides sought to influence. Graham's contention that he alone understood nature's laws was a tidy way to undercut the doctors' authority in the pages of their own journal and establish his credibility as an impartial, scientific observer. Yet in the end, the argument in the *Journal* was less an attempt to convince the opposition, and more of an opportunity for grandstanding for both factions, with surrogates like William Alcott chiming in on behalf of Graham and Thomas Lee of McLean asylum taking Bell's position.[116]

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[114] See, e.g., "Grahamism a Cause of Insanity," *Boston Medical and Surgical Journal* 14, no. 3 (February 24, 1836): 38–46, doi:10.1056/NEJM183602240140302; "Dr. Bell's Prize Dissertation and Mr. Graham's Strictures," *Boston Medical and Surgical Journal* 13, no. 24 (January 20, 1836), 379–82, doi:10.1056/NEJM183601200132403.

[115] Sylvester Graham, "Remarks on Dr. Bell's Prize Essay," 347–52, doi:10.1056/NEJM183601060132203.

[116] Shprintzen, *The Vegetarian Crusade,* 41–42.

The impasse between the physicians and Graham stemmed from their philosophical differences, rather than any particular outrage felt by anyone about a diet that included (or avoided) meat. Bell, representing medical orthodoxy, held that people must be guided by reason and conscience; otherwise, they would be falsely guided by their lower nature. By contrast, Graham sought to bypass not just culture but the conscious mind entirely by positing that the only true guide to right living was to heed the strictures of man's lower nature. For both of these competing visions of the body, diet was a means for affecting the proper adjustment: either to integrate oneself more completely into society, or, by contrast, to help build a retreat from the world. Bell's essay was intended to bring the workers of New England back into the fold of right living and proper bodily management, guided by dietary common sense. Right regimen was just important as right conduct for remaining mentally, physically, socially, politically, and spiritually balanced, and medical advice was the means for providing a guide for the proper care of the body.

It's worth reiterating that "common sense" in Bell's hands was not simply a rhetorical tactic for placing his opponent's ideas beyond the pale; instead, it was a statement of belief in the power of impartial observation and logic to construct the right course of action, and the value of educating others about the correctness of this approach. Bell's construction of dietary common sense was a first iteration of nutrition being seen as a social question. In his essay, Bell brought physicians' attention to the eating habits of the working class, by arguing that the workers' diet had an important bearing on the health and productive capacity of society. This essay was charged with a sense of urgency, as Bell and his fellow physicians were worried that Graham's ideas would threaten their authority. Worse, the mass of New Englanders might fall prey to a vegetarian mania that would keep them from maintaining a state of stable health. The notion that the mass of people might align themselves with a set diet in order to safeguard the health of society was the central point of making nutrition into a social question. Other components of nutrition as a social question were less

prominent in this early stage of development. For one, science took second place to moral suasion in Bell's essay. Bell drew on comparative anatomy and physiology to buttress his claims about diet, but the notion that chemistry could be a way to measure the nutrient content of foods—let alone a means for determining a nutritional standard—was outside of the bounds of what Bell thought was prudent or possible. Further, Bell's interest in alimentary improvement was not linked to some broader notion of progress. He did not think that the workers of New England could bring themselves to a state of physical perfection by eating a perfect diet, nor was he interested in the relationship of the diet to the productive power of their labor. His vision was instead one of continual adjustment to maintain the harmony between a person and the environment in which he lived. Making sure workers maintained their health was primarily about letting people decide what diet was right for them, as long as they allowed themselves to be rightly guided by medicine. At the same time, Bell's essay was a step toward the erosion of the notion that average people might have an innate or natural sense of the right course of diet and regimen; instead, they needed to be educated by men like Bell, who represented the authority of reason itself.

Chapter 2: The Moral Minimum: Nutrition and Mass Feeding in American Prisons and Asylums, 1840s–1850s

In the 1850s, the Commissioners on Emigration in New York City were faced with an influx of immigrants coming from Europe. Many of the newcomers were escaping war or famine, and were in poor health due to malnutrition and illnesses contracted on the long sea voyage. The commissioners additionally faced a tight budget; neither state funds nor private charity were sufficient to meet the immigrants' needs. In order to find ways to cut costs, the commissioners asked a chemist and social reformer, John Stanton Gould (1810-1874), to design an optimally inexpensive institutional diet that would preserve the health of the people housed in the refuge.[117] In his 1852 publication *A Report on Food and Diet with Observations on the Dietetical Regimen, Suited for Almshouses, Prisons, and Hospitals,* Gould compiled all the information he could find about institutional dietaries in Europe and North America, and used the latest developments in the chemistry of food and the study of digestion and assimilation to calculate the constituents of an ideal institutional diet. Gould began his researches expecting to identify at least one institution where the inmates were healthy and strong and the costs for feeding them were kept reasonably low. Despite scouring the East Coast and reading the reports of overseas institutions, he was unable to locate one. "I have failed to collect the information required, simply because it is not in existence," he wrote. "It remains to be created."[118]

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[117] "Fifth Annual Report, 1851," in *Annual Reports of the Commissioners of Emigration of the State of New York, from the Organization of the Commission, May 1847 to 1860, Inclusive: Together with Tables and Reports, and Other Official Documents, Compiled and Prepared Under Resolution Adopted by the Board, August 29, 1860* (New York: [Commissioners of Emigration], 1861), 102–3.

[118] John Stanton Gould, *A Report on Food and Diet, with Observations on the Dietetical Regimen, Suited for Almshouses, Prisons, and Hospitals; Also on Heating, Ventilation, &c., with Practical Recommendations* (New York: W. C. Bryant, 1852), 9.

The notion that an ideal diet could be created suggests a shift in nutrition toward a reliance on natural science to provide the basic facts of food and diet. While Luther Bell rejected chemistry as a means to determine the amount of food needed by a person, Gould embraced it. This was driven by a growing acceptance of chemical quantification for understanding food and diet and an interest in putting chemistry to practical use. On the face of it, this choice was driven by the necessity of allotting set rations to the people in the almshouse; agricultural chemistry, with its focus on counting the nutrients in food, would seem to be a useful tool. Yet on a deeper level it indicates a broader shift in consensus about the value of chemistry for understanding diet. This changing consensus was driven in part by the high profile of European agricultural and animal chemistry in the US in the 1840s and 50s, as it was perceived to be useful for improving manufacturing and agriculture.[119] Gould had received little formal training in chemistry, but had worked as a practical chemist for a time, wrote occasionally for the agricultural press, and retained an interest in science throughout his life. It was in his capacity as a chemist that the Commissioners on Emigration sought his expertise, and it was chemistry that was his first recourse when trying to decide on a correct diet for institutions, based on the nutrition content of the diet and its quantity. This was a new approach in the United States; previously, prison inspectors had judged whether a diet was adequate based on a simple description of its contents.[120] To arrive at the best form of diet, Gould read the relevant works on chemistry and used analyses of the nutrient content of food to compare various bills of

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[119] Emily Pawley, "Accounting with the Fields: Chemistry and Value in Nutriment in American Agricultural Improvement, 1835–1860," *Science as Culture* 19, no. 4 (2010): 461–82, doi:10.1080/09505431.2010.519868; Benjamin R. Cohen, *Notes from the Ground: Science, Soil, and Society in the American Countryside*, Yale Agrarian Studies Series (New Haven: Yale University Press, 2009); Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002).

[120] See, e.g., the report of the Greene County Prison, examined in 1847. The food was three meals per day, with coffee, fish or meat, bread and sometimes butter for breakfast, meat and potatoes for dinner, and molasses or spawn (a small fish) and milk at supper. The inspectors thought this was a good prison diet. *Annual report of the Executive Committee of the Prison Association of New York and accompanying documents*. (Albany [N.Y.], 1849.

fare, as well as outlining a plan for maintaining the health of the inmates while not allowing them the luxury of excess food.

At the same time, certain concerns of the 1830s had lingered. Gould thought that natural science had to be balanced with moral concerns in order to be useful. His adoption of scientific ideas took place in the context of a moral economy that bore many of the same features as that of the 1830s. A Whig in politics as well as a social reformer, Gould had an interest in social improvement, just like his fellow Whigs. He saw nutrition as resting on a set of moral concerns that linked healthy bodies with healthy morals and healthy societies. Gould was a devout Quaker, and he understood his faith to be in lockstep with his scientific knowledge. Right conduct, as informed by both religion and science, was essential in all aspects of life in order to attain a state of grace. However, prison and almshouse inmates were far different from New England workers, who might be trusted to make informed decisions about their diet. The fact that people resided within an almshouse or prison cast their capacity for judgment into doubt, requiring an institution manager to substitute his own prudent good sense for that of his charges. Just as a person must have access to the Gospel in order to choose to believe, he must be taught the right information about diet and regimen in order to choose the best way to manage his own health. In a further echo of the nutritional discourse of the 1830s, while Gould believed that a correct regimen could be designed with the help of chemistry, he also thought that nutrition, a subject that was essentially a concern for an individual, was not quite a concept that could be applied to masses of people, and this knowledge limited Gould's ambitions for creating a ideal institutional diet.

A further new facet of nutrition as a social question was the push to connect European ideas about dietary reform to American ones. Gould paid close attention to a broader transatlantic movement to reform the management of the poor and the criminal in Europe and North America, which acted as an avenue for questions about institutional diets. The food served in almshouses and

prisons was an important part of poor house and prison reform. Europeans and Americans were keenly interested in the new ideas in institutional management being tried out across the Atlantic, and European governments sent representatives to observe American experiments in prison reform.[121] Americans like Gould took a particular interest in British ideas about institutional dietaries, in particular the changes in workhouse management that were instituted by the British government after the Poor Law Amendment Act of 1834. These changes raised the question of whether the diet should be at bare subsistence, or should maintain the health of the workers. While Gould's ultimate design for the diet of almshouses and prisons differed considerably from the diet adopted at British institutions, his work was informed by the transatlantic conversation about how almshouses and prisons could be used in the service of social reform.

Gould's explicit emphasis on using chemistry to create a diet for inmates of prisons and asylums would help them reform themselves was a crucial aspect of making nutrition into a social question. His first intellectual resource for trying to create this diet were agricultural chemistry, which helped him determine how food nourished the body and make estimates about how much food would be needed to a greater level of quantitative exactitude than had previously been possible. This interest in precise measurement was steered by his religious faith, which had steered his interest toward social reform to begin with and directed his attention to the humane care of prisoners and asylum inmates. His third intellectual resource was the transatlantic discourse of asylum reform, which influenced his ideas about how much food was needed by an incarcerated person. Gould interwove his religious and social beliefs with his scientific and medical knowledge in order to create

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[121] Gustave de Beaumont and Alexis de Tocqueville, *On the Penitentiary System in the United States and Its Application in France; with an Appendix on Penal Colonies and Also Statistical Notes,* trans. Francis Lieber (Philadelphia: Carey, Lea & Blanchard, 1833), 1; Johann Ludwig Tellkampf and Theodor Tellkampf, *Über die Besserungsgefängnisse in Nordamerika und England, nach eigenen Beobachtungen in den Jahren 1838 bis 1843* (Berlin, Rücker, 1844).

a framework for managing institutional dietaries that he believed served the ends of both economy and justice.

Cultivating the Inner Light

Gould's education and social connections were an important influence on his views about social reform. His education shaped his belief in the value of moral rectitude and the importance of inducing others to improve themselves, and his social connections in New York City reform circles allowed him to put his beliefs into practice. He was born in 1821 in Newport, Rhode Island, the only child of Quaker parents. His father, Stephen Wanton Gould, was a watchmaker active in the Society of Friends as well as in philanthropic work at the local almshouse. Gould followed his father's example in maintaining an interest in benevolent work throughout his life. He could hardly have done otherwise, as he was steeped in a religious culture that privileged moral and religious concerns above all, and saw individual morality inextricably linked with the fate of society and even one's own health. Quaker thought was the most important influence on his life and work, and all of his philanthropic and legislative activities—particularly temperance, prison reform, and the abolition of capital punishment—were undertaken based on the notion that each drunkard reformed, each prisoner rehabilitated, and each murderer spared the gallows would bring about a better society. Gould saw this belief reflected in his early education. In 1820, the eight-year-old Gould read *A History of England From Early Times,* an experience he considered to be the most important one in his intellectual life. In a characteristic blending of the factual with the moral, Gould wrote that the book impressed upon him the notion that history was progressive, trending toward a "nobler and purer life for the nation." Collective improvement needed to be brought about by a strong central authority to act as a bulwark against moral degradation and poverty:

> Another conviction which [*A History of England*] fastened upon my mind was that all true statesmanship consisted in the improvement of the poor. I saw that all real

> prosperity arose from this. If the poor are kept in comfort, all classes will be comfortable, if the poor are depressed the middle and upper classes must participate in the depression, if the poor feel that the government is beneficent, the nation is strong, if the poor feel that the government instead of being a blessing, is crushing them with its iron heel, that nation though possessing ever so great an appearance of wealth and power is really weak, and cannot abide the shock of the conflict and the storm.[122]

Gould thought that God blessed those who cared for the poor and punished those who did not. This was particularly clear in the case of nations, where the "track of retributive justice was always clear and unmistakable," Gould wrote, leading to a just punishment for sins like war and slavery.[123] Therefore, it was imperative for all to work for social betterment and to help others avoid error. This was not mere rhetoric for Gould. As an adult, he continually rebuked himself in his diary for falling short of perfection in his love for God and his labors for God's glory. Gould firmly believed in the possibility of attaining perfection in this life.[124]

Gould was no outlier among his fellow Quakers in believing that good works were essential in both private and public life. Personal rectitude and public betterment were the hallmarks of Quaker social beliefs in the early nineteenth century. Quakers were both inward looking and outward facing: they were noted for their sober demeanor and social insularity, as well as their entrepreneurial spirit and their deep involvement in civic causes like antislavery and the founding of schools, mental hospitals, and prisons.[125] Quakers had an "experimental attitude" toward reform: new ideas should

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[122] John Stanton Gould to Mary Gould Baldwin, June 3, 1865, Gould Family Papers, Cornell. , #2033. Division of Rare and Manuscript Collections, Cornell University Library. Hereafter Gould Family Papers, Cornell. Gould likely read an American edition of *A History of England from Early Times* that combined David Hume and Tobias Smollett's histories of England.

[123] John Stanton Gould to Mary Gould Baldwin, April 29, 1865; May 6, 1865; March 27, 1867; Gould Family Papers, Cornell.

[124] Gould Diary, Nov. 10, 1866 entry; John Stanton Gould, Journal of Residence at Albany, Jan. 1, 1848; Gould Family Papers, Cornell.

[125] David Brion Davis, *The Problem of Slavery in the Age of Revolution* (New York: Oxford University Press, 1999), 216–17.

be tried and then evaluated for their efficacy.[126] Undergirding both the inward and outward orientations was the Quaker religious concept of the Inner Light: a force within all people that was the light of God. It was a religious duty to cultivate one's own Inner Light through personal rectitude, and the will of others could compensate if individual efforts fell short. Quakers put their own community under strict regulations governing things as small as fancy dress or going to the theater, and as large as marrying out of the faith or owning slaves.[127] It was also an obligation to remove barriers that kept the Light from shining out of all people, so Quakers were involved in a variety of social reform projects. Any form of vice blocked the Light, even drunkenness or lying, and redemption came from introspection and religious study. Therefore, one of the aims of a Quaker prison or asylum ought to be to allow an inmate to redeem himself by opening himself up to the Light. Diet and treatment in Quaker-run institutions tended to be generous and gentle, if rather austere, to allow inmates to self-reform.[128]

Maintaining group identity was a religious and moral necessity, and so Quakers attended only Quaker-run schools.[129] Gould attended a Quaker grammar school in Newport and supplemented his classroom instruction with lessons in Latin and Greek given to him by a local doctor, Enoch Hazard. The physician granted his student free rein over his library, so Gould read anatomy, physiology, and treatises on the practice of medicine. Gould completed his formal education at the Yearly Meeting School, a Quaker boarding school in Providence, Rhode Island. Quaker schools of

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[126] Christopher Adamson, "Evangelical Quakerism and the Early American Penitentiary Revisited: The Contributions of Thomas Eddy, Roberts Vaux, John Griscom, Stephen Grellet, Elisha Bates, and Isaac Hopper," *Quaker History* 90, no. 2 (October 1, 2001): 35–58.

[127] Thomas D. Hamm, *The Quakers in America* (New York: Columbia University Press, 2006), 32.

[128] Charles L. Cherry, *A Quiet Haven: Quakers, Moral Treatment, and Asylum Reform* (Rutherford, NJ: Fairleigh Dickinson University Press, 1989), 91; Adamson, "Evangelical Quakerism and the Early American Penitentiary Revisited."

[129] Cherry, *A Quiet Haven,* 92.

the period were noted for their emphasis on mathematics and the natural sciences, and Gould studied mathematics and classical languages, and was introduced to new subjects such as practical astronomy and navigation. He studied natural philosophy, natural history, and chemistry under a Dr. Tobey, a practicing physician who had attended medical lectures in Philadelphia and taught at the school. Due to his curiosity about chemistry Gould became an assistant in Tobey's chemical laboratory, which "gave me a very great advantage," Gould wrote, "as I not only assisted him in preparing his escperiments [sic] but had an opportunity of making them for myself."[130]

Gould finished school in 1827 at the age of fifteen and began to look for employment. He was apparently considered an able young man who was ripe for further education, as he had a number of offers: to work in a Philadelphia firm, to become a teacher, or to become a doctor. Gould rejected the first offer as he did not think he would be a good businessman. The teaching profession was likewise out of the question. Even though the Yearly Meeting School offered him a job, he did not accept it as it would mean having to go to college. In his memoir, Gould did not elaborate on why he was opposed to attending college, but it is likely that he wanted to protect himself against non-Quaker influences. The historian Thomas Hamm has noted that early nineteenth-century Quakers opposed colleges, as their primary mission was educating the clergy. Instead of the leadership of a single pastor, Quakerism was composed of a "ministry of all believers." God called on all to preach, and so it would be wrong to designate a single religious leader who had been specifically trained for the task.[131] The medical profession was a much more tempting offer. Gould's old tutor Dr. Hazard presented his pupil with a generous proposal: he would foot the bill for Gould's apprenticeship as a physician, and would even pay for Gould to spend a year

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[130] John Stanton Gould to Mary Gould Baldwin, September 2, 1865; Gould Family Papers, Cornell.

[131] Hamm, *The Quakers in America*, 86, 110.

studying at the hospitals in Paris, a secular education that would have been acceptable to a devout Quaker. When Gould returned from abroad, Hazard promised to give him his medical practice in Newport. "This was a grand offer pecuniarily and the profession was very congenial to me," Gould wrote. "I already had a very good foundation in Anatomy and Physiology, and nothing was more interesting to me than the phenomena of health and disease which medicine would bring before me." In the end Gould declined the offer because he thought his health would be jeopardized by the fact that doctors had to call on patients at all hours: the interrupted sleep of the busy practitioner was not a prospect he relished.[132]

Gould ultimately accepted a position in the chemical department of a calico factory in Hudson, New York. Situated on the Hudson thirty miles downriver from Albany, Hudson was a growing town, with a mix of agriculture and industry.[133] The calico firm had been started by a friend of Gould's a few years earlier. While Gould had no particular affection for dye chemistry or cloth manufacturing, he took the job to obtain European scientific journals that he had not had access to at the Yearly Meeting School. Gould prepared for the job by reading chemistry treatises on dying and general reference works.[134] Though he enjoyed the intellectual stimulation offered by his studies, Gould was disappointed by his job. He thought the chemical processes he performed at the factory were "coarse and dirty and unattractive." His co-workers were ignorant of theoretical chemistry and knew only the empirical processes by which colors could be produced, which greatly displeased Gould.

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[132] John Stanton Gould to Mary Gould Baldwin, October 28, 1865; Gould Family Papers, Cornell.

[133] Thomas S. Wermuth, *Rip Van Winkle's Neighbors: The Transformation of Rural Society in the Hudson River Valley, 1720–1850* (Albany: State University of New York Press, 2001), 123.

[134] John Stanton Gould to Mary Gould Baldwin, February 17, 1866; Gould Family Papers, Cornell. , Cornell. The books Gould read were Claude-Louis Berthollet's *Elements of the Art of Dyeing*, Joseph Black's *Lectures on the Elements of Chemistry*, Andrew Ure's *Dictionary of Chemistry*, and Edward Bancroft's *Experimental Researches Concerning the Philosophy of Permanent Colors.*

Gould escaped Hudson whenever he could to visit Quakers in New York and New England. He believed that spending time with genteel, edifying people would put the wheels of moral improvement in motion. By contrast, a person kept among bad influences (like, presumably, grubby Hudson mechanics) would inevitably become worse. Gould's travels along the East Coast introduced him to a network of men who shared his interests. In the late 1820s Gould made his first visit to New York City, a trip that filled him with joy for the chance to participate in refined Quaker society and learn its ways.[135] There he engaged with a network of men who shared his interests. In New York, he met the chemical lecturer and education reformer John Griscom and his son John Hoskins Griscom, the future physician and sanitary reformer. On a later trip to Massachusetts to visit cloth mills in Fall River, Gould met the young physician Elisha Bartlett as well as the chemist and cloth manufacturer Samuel Luther Dana, who took the opportunity to inform the younger man of new developments in chemistry. Returning to the calico factory in Hudson after trips like these was not easy. "Often as I stood pounding drugs, stirring solutions, or filtering precipitates, I would think of the polished society and the cleanly occupations of New York and contrast them with my own dirty employment and ungenial associations until the tears stood in my eyes," he wrote.[136]

Gould left the Hudson works in 1835. He was twenty-three, and had recently married Martha Stanton. His work was now managing his wife's farm in Hudson, which gave him a steady income as well as leisure, as the land was farmed by a tenant. Gould had given temperance and political speeches in the 1820s, and he could now devote himself to the causes that consumed his energies for the rest of his life: reform, state politics, agricultural improvement, and the study of medicine, chemistry, and general physics. Like his fellow Friends, Gould thought that the application

[135] John Stanton Gould to Mary Gould Baldwin, March 4, 1866; March 18, 1866; Gould Family Papers, Cornell.

[136] John Stanton Gould to Mary Gould Baldwin, April 7, 1866; Gould Family Papers, Cornell.

of scientific methods of management to society would help stem the tides of vice, crime, and disorder. In this he was an indefatigable worker: he poured his energies into the temperance reform movement, the push to abolish capital punishment, the collection of crime statistics, and politics, serving a term in the New York State legislature. He was introduced to institutional management through his work with the New York Prison Association (NYPA), a voluntary group which aimed to assist individual prisoners' rehabilitation and make prisons both more humane and more perfect tools for social reform.[137] Later in life, Gould would help found Cornell University and gave lectures on agriculture there in the 1860s and '70s. Gould's service in the New York State legislature in the 1840s allowed him to pursue prison reform directly, trying to put the NYPA's recommendations for change into actual law, with some success. He founded the New York State Prisons Board in 1846, and while on the board overhauled the laws relating to prison discipline, abolishing the use of the lash as punishment.[138] His time in politics was short, however, because of his distaste for his fellow legislators. He was particularly disgusted by the legislature's enthusiasm for the 1846–48 Mexican War, and infuriated that they would rush to send troops to fight rather than support worthier causes. Gould noted bitterly in his diary that some of his own initiatives—like abolishing capital punishment, and appropriating money for common schools and the New York College of Physicians and Surgeons—were opposed or even ridiculed by his colleagues.[139]

By 1848, Gould was spending fewer days in Albany and more time with like-minded friends and colleagues in New York City. These relationships constituted a network committed to instituting

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[137] Jennifer Graber, *The Furnace of Affliction: Prisons & Religion in Antebellum America* (Chapel Hill: University of North Carolina Press, 2011), 136. The NYPA still exists, though its name is now the Correctional Association of New York. John Stanton Gould to Mary Gould Baldwin, May 26, 1866; June 3, 1866; April 28, 1867; January 27, 1867. Gould Family Papers, Cornell.

[138] Gould, Journal of Residence at Albany, 1847–1850, Gould Family Papers, Cornell. ; "Gould on Hanging," *New-York Daily Tribune*, February 15, 1848.

[139] Gould, Journal of Residence at Albany, March 14, 16, and 24, 1847; Gould Family Papers, Cornell.

social change in the city, as state and local governments either could not, or would not, ameliorate problems in public sanitation, poor relief, and the care of immigrants..[140] In New York, Gould spent time with John Hoskins Griscom, who had delivered his lecture on *Sanitary Conditions of the Laboring Population of New York* in 1844; the abolitionist newspaper editor Horace Greeley; the members of the NYPA; and Cyrus Curtiss, a member of the Commissioners on Emigration. Gould's reputation as a chemist and reformer, which he had built through self-study and through his political and reform work, led Curtiss to ask him if he would examine the dietary at the Emigrant Refuge on Ward's Island and find a way to improve it.[141]

Feeding the Huddled Masses in New York

In the late 1840s, charitable organizations in New York City were hard-pressed to meet the needs of its poorest citizens. An economic recession had increased the number of people who were homeless or needy, and the growth in poverty was accompanied by more crime.[142] A wave of immigration from Ireland was of particular concern, as their numbers and their need far outstripped the capacities of the city's institutions to care for them. The Irish famine had begun in 1845, and over the course of the next ten years 1.5 million people left Ireland for America, with many of them arriving in New York.[143] They were housed on Ward's Island, in the East River. Alongside Rikers Island, North Brother Island, and Randall's Island, Ward's Island was a place to house undesirables

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[140] Paul Boyer, *Urban Masses and Moral Order in America, 1820–1920* (Cambridge, MA: Harvard University Press, 1978), 87–93; John Duffy, *The Sanitarians: A History of American Public Health* (Urbana: University of Illinois Press, 1990), 96–97.

[141] Gould, "Introductory Letter," in *A Report on Food and Diet.*

[142] Graber, *The Furnace of Affliction*, 159.

[143] Roger Daniels, *Coming to America: A History of Immigration and Ethnicity in American* Life (New York: Harper Collins, 1990), 135.

at a watery remove from Manhattan. The city bought Ward's Island in 1851 for the purpose of building the Emigrant Refuge, after having used the island as a potter's field since 1847. In the mid-nineteenth century the island also hosted an orphanage, almshouse, and insane asylum.[144] Previously, New York State had supported the quarantine at the Marine Hospital on Staten Island by levying a tax on incoming ship passengers, but by the late 1840s this level of funding proved inadequate. Immigrants could dodge the tax collector, and some of the funds were diverted into others' pockets via corruption, leaving only a paltry sum to cover caring for new arrivals. In 1847, the German and Irish immigrant societies and other humanitarian groups pressured the New York State legislature to establish the Commissioners on Emigration.[145] The group was comprised of representatives of the immigrant societies and led by a board of wealthy citizens, many of whom were Quakers, such as Robert Minturn, who was also one of the leaders of the New York Association for Improving the Condition of the Poor.[146]

Even though the Commissioners on Emigration had been given the authority to create a benevolent infrastructure for the care of immigrants, the organization's funding was limited, and they had to husband their resources at the hospitals and almshouses they created. One of the biggest expenses was the dietary, but it was hard to know how to cut costs. Nothing could be found in books to guide or assist the Commissioners in their inquiries about parsimonious management, wrote Gould, and so they had asked him to determine the best and least expensive way to adequately

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[144] Stuart Miller, *The Other Islands of New York City: A Historical Companion* (Woodstock, VT: Countryman Press, 1996). "Islands of the Undesirables: Randall's Island and Wards Island," Atlas Obscura, 51:00 400AD, http://www.atlasobscura.com/articles/islands-of-the-undesirables-randall-s-island-and-wards-island. Today, the island houses the Manhattan Psychiatric Center and the Kirby Forensic Psychiatric Center, as well as the world's highest capacity sewage treatment plant. The island still serves as a place to take (and treat) whoever and whatever isn't wanted in the city.

[145] Richard J. Purcell, "The New York Commissioners of Emigration and Irish Immigrants: 1847–1860," *Studies: An Irish Quarterly Review* 37, no. 145 (March 1, 1948): 29–42.

[146] Boyer, *Urban Masses and Moral Order in America, 1820–1920,* 89.

feed large masses of people. The Commissioners' annual report notes that the dietary in their institutions had already been "arranged with great care," and that Gould was of the opinion that theirs was already one of the best in the country.[147] Therefore, his task was to determine if further dietary perfection could be achieved, while keeping costs at a minimum. In his report, Gould wrote that he was charged with finding the "least amount and cheapest food by which a prisoner or pauper could be supported as to preserve his health and strength." The key concept here is *preserve,* as Gould did not want to have inmates gain weight in prison by feeding them a better diet than they had been accustomed to.[148]

Gould's scientific touchstone for his analysis was Justus von Liebig's chemical description of the production of heat and work in living bodies, as laid out in his 1842 book *Animal Chemistry*. Liebig's book provided a speculative model for animal metabolism that managed to bring together a number of different ideas and assumptions about the chemistry of living things, among them Antoine-Laurent de Lavoisier's assumption that the oxidation of foodstuffs provided heat for the body, Gerrit Jan Mulder's idea that animals used plant proteins to synthesize animal proteins, and William Prout's notion that one could depict animal chemistry as a series of chemical reactions. Liebig described the animal body as having precise, measurable chemical inputs and outputs for producing animal heat and muscular work. Carbon, in the form of sugars and fats, was oxidized in the lungs to create heat, and the carbon dioxide breathed out was the index of the rate of heat production. Nitrogen, ingested in the form of meat and vegetable proteins, formed the blood and tissue of the body. When an animal ate, the nitrogen it ingested entered the bloodstream after digestion to form muscle tissue. The rate at which it did so was related to the amount of muscular

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[147] *Annual Reports of the Commissioners of Emigration of the State of New York,* August 29, 1860, 103.

[148] Gould, "Introductory Letter," in *A Report on Food and Diet*.

force exerted by the body. When a body worked, the muscles expended their own tissue to produce muscular force, and the "burned" nitrogen was subsequently excreted as a waste product. This cycle of nutrition, digestion, absorption, and expenditure Liebig called the *Stoffwechsel.* One could measure the *Stoffwechsel* by using a balance method: first determining the chemical composition of the food, allowing an experimental subject to ingest it, then analyzing the body's waste. A scientist could determine how much work was performed by the body by measuring the quantity of nitrogen in the urine, as Leibig assumed that nitrogen could not pass directly out of the body without first forming muscle tissue. More work equaled more muscular breakdown, which equaled more nitrogen excreted.[149]

Liebig's model was speculative, and its description of a purely chemical metabolism left little room for the knowledge gained about nutrition through physiology. Consequently, *Animal Chemistry* polarized scientific opinion in Europe and the United States. The historian of science Frederic Lawrence Holmes has noted that the reception of Liebig's ideas "depended on the expectations, the previous interests, the enthusiasms, and the personal sympathies of those concerned, as much as on their objective evaluations of the evidence for or against his conclusions."[150] Friedrich Wöhler, a chemist who had worked on the synthesis of urea with Liebig, thought the book was intriguing but lacking in evidence. Likewise, the physiologist Johannes Müller was not quite ready to accept Liebig's generalizations about the chemical theory of respiration. Others took a more aggressive stance: The chemist Jöns Jacob Berzelius, a former mentor of Liebig's, panned *Animal Chemistry* in not one but

[149] McCollum, *A History of Nutrition; the Sequence of Ideas in Nutrition Investigations*, 88; Frederic L. Holmes, introduction to *Animal Chemistry; or Organic Chemistry in Its Application to Physiology and Pathology, by Justus Liebig*, ed. William Gregory, A Facsimile of the Cambridge Edition of 1842, no. 4 (New York: Johnson Reprint Corp, 1964), lii; Kenneth J. Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition* (Cambridge: Cambridge University Press, 1994), 46–51.

[150] Holmes, introduction to *Animal Chemistry,* lxv.

two reviews, arguing that it rested on far too few verified facts to be useful.[151] The American physician Charles Caldwell was even more scathing, arguing that chemistry itself had no bearing on physiology at all.[152] It was clear to many that some natural phenomena could not be accounted for under Liebig's system. For example, the British pharmacist Jonathan Pereira noted in 1843 that it was not likely that sugar and fat were combusted in the lungs, as physiologists had not detected these substances in the blood as it moved from the stomach to the lungs.[153] Nor could Liebig's model account for the fact that herbivorous animals like draft horses could produce so much work while eating only grass and other foods low in nitrogen.[154] Yet, much of the criticism was within German university circles; few chemists outside this group were knowledgeable enough to mount a sustained critique.[155]

While Liebig's model of metabolism was to eventually collapse under the weight of sustained physiological and chemical investigation, for a time in the 1840s and '50s it was a foundational one for nineteenth-century nutrition science. In the US, news about it spread through the agricultural press, and Liebig's *Animal Chemistry* went through several printings.[156] Gould used analyses of the nitrogen and carbon content of food made by Liebig, Prout, and Pereira to calculate the amount of carbon and nitrogen in institutional dietaries. Pereira's 1843 *Treatise on Food and Diet*

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[151] Ibid., lviii.

[152] Charles Caldwell, *Physiology Vindicated; in a Critique on Liebig's Animal Chemistry.* (Jeffersonville, Indiana: Tilden, 1843); Herbert S. Klickstein, "Charles Caldwell and the Controversy in America over Liebig's 'Animal Chemistry,'" *Chymia* 4 (January 1, 1953): 129–57, doi:10.2307/27757166.

[153] Jonathan Pereira, *A Treatise on Food and Diet: With Observations on the Dietetical Regimen Suited for Disordered States of the Digestive Organs; and an Account of the Dietaries of Some of the Principal Metropolitan and Other Establishments for Paupers, Lunatics, Criminals, Children, the Sick, &c* (New York: J. & H.G. Langley, 1843), 25.

[154] William H. Brock, *Justus von Liebig: The Chemical Gatekeeper* (Cambridge: Cambridge University Press, 1997), 201.

[155] Ibid., 195.

[156] Margaret W. Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840-1880*, Yale Studies in the History of Science and Medicine 9 (New Haven: Yale University Press, 1975).

was the source of much of Gould's information on the chemistry of food and its implications for human diet. Pereira's book also helped Gould frame his ideas about institutional diet, as a substantial portion of it reviewed the dietaries of British prisons, almshouses, and schools. The format of Gould's book—which first considered the chemistry of food and then its implications for institutional diets—followed that of Pereira's work.

Americans like Gould were interested in Liebig's chemistry as an applied science, and the appeal of his model of metabolism stemmed from its simplicity and clarity. It posited a straightforward balance between food and labor. The notion that carbon fueled respiration and nitrogen was the essential fuel for labor was particularly powerful, as relying on two indices made it very simple to assess the nutritional value of a diet. Easier still, there was one index for understanding how much nitrogen was needed: the amount of nitrogen excreted could be used to measure the amount of it needed by the body to support life and work. Gould adopted Liebig's model wholesale, and much of his report was dedicated to explaining how the science of metabolism was relevant to the subject of institutional diets. Gould likely did so in order to educate his readers and to establish his own expertise. As he had been given the task of designing an institutional diet specifically for his chemical expertise it is unlikely that he had to convince his readers—many of whom were Quakers like himself, and immersed in Quaker attitudes towards science—of the utility of chemistry when designing a diet.

A major scientific question for Gould was dietetic equivalencies: whether different foods could substitute for one another. This was one of the chief practical ways that chemistry could improve the diets of institutions. In theory, substitutions made sense: as foods contained varying amounts of nitrogen and people needed a certain amount of nitrogen daily, one food could substitute for a quantity of another. Institutions already made these kinds of substitutions, guided by intuitive rules of thumb rather than evidence. For example, the United States Army designed its

ration on the assumption that three-fifths of a pound of salt pork was equal to one pound of fresh beef. The rule might have stemmed from the feeling of satiety that persists long after eating fatty, heavy pork, and indeed William Beaumont found that pork took two to three hours longer to digest than beef in his famous experiments on Alexis St. Martin.[157] That being said, Beaumont's finding was not offered as the reason for why pork was given in a lesser amount than beef, and Gould himself found no scientific rationale for it. Gould's most important resource for establishing dietetic equivalencies was the work of the French chemist Jean-Baptiste Boussingault. In 1836, Boussingault attempted to put dietetic equivalencies on firmer empirical footing for the purposes of determining a better way to fatten farm animals. Boussingault built on Magendie's ideas about the centrality of nitrogen in animal nutrition, listing the nitrogen content of common vegetable foodstuffs in a table so that substitutions could be made of one foodstuff for another. He found this table to be useful in the 1840s, when a drought hit farmers in his home region of Alsace. Under his guidance, farmers fed their animals with potatoes rather than hay, which helped the farms weather the drought.[158] While Boussingault had his doubts about whether nitrogen should be the prime criterion of how nutritious food was, he thought that when nitrogen was present at high levels other organic and inorganic nutrients were present as well, making nitrogen a reasonable rule of thumb for judging nutritional value.[159] The French chemist thought that this work had value for humans as well, and Gould agreed: he considered Boussingault's scale of dietetic equivalencies for grain products important enough to reproduce in his report, as he thought institution managers would find it

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[157] William Beaumont, *Experiments and Observations on the Gastric Juice and the Physiology of Digestion (*Birmingham, AL: Classics of Medicine Library, 1833), 34; Ronald L. Numbers and William J. Orr, "William Beaumont's Reception at Home and Abroad," *Isis* 72, no. 4 (December 1, 1981): 590–612.

[158] Simmons, *Vital Minimum,* 24.

[159] Carpenter, *Protein and Energy,* 32.

useful.[160] Using it, a warden could substitute one food for another while maintaining the same nutritional value in the dietary. If an institution was short on wheat flour, a superintendent could use Boussingault's scale to substitute 1.38 pounds of corn meal to equal the nitrogen content of bread made from one pound of wheat flour. But the chemistry of determining nitrogen values was not settled and so these values were by no means exact. Gould knew this, so one of his aims for his report was to verify the scale with feeding experiments on inmates. For example, a feeding trial could determine whether an institution could substitute cheaper foods like wheaten bread or potatoes for a portion of the meat ration, thereby saving money on the dietary. This ambition, however, was a frustrated one, as it seems that no administrator allowed Gould to conduct feeding experiments on his charges.

As he could not directly experiment on inmates, Gould's method for determining the best dietary for paupers and prisoners was to survey twenty institutions in the United States and then to compare their bills of fare, as understood through the weight of the food served daily or weekly. Before he began his study, Gould expected that he would find a prison or almshouse that had managed to hit the right balance between sufficiency and indulgence, and he intended to use that dietary as a model for other institutions to follow. In this, Gould was disappointed, as many wardens gave little thought to their dietaries at all. As the physician Charles Lee had noted a decade before, the prevailing custom for caring for paupers in rural New England was for a town to "put up their paupers, in a general town meeting, to the lowest bidder," so that provisioning the poor was a "perpetual experiment" in how little paupers could be fed.[161] Even among institutions that were better managed than that and kept a stable bill of fare, Gould found no institution that calculated how much each inmate should eat, nor was there any rationale for the type and quantity of food

[160] Gould, *A Report on Food and Diet*, 20.

[161] Charles A. Lee, "On Dietaries," *New York Journal of Medicine* 1, no. 2 (1843): 341–69.

chosen. In the absence of this more exact information, Gould could obtain only the weight of the food bought by an institution per week. This figure included the inedible parts, such as the bones of the meat. It also did not account for waste in preparing and serving, or the possibility that wardens, orderlies, jailers, or cooks would take some of the food themselves. Gould divided the weight of the food bought per week by the number of inmates housed in each institution to calculate the food allocated per person. He drew up his findings in a table, shown below.[162]

A.—*Table shewing the quantity of food allowed to each person weekly, at the following institutions.*

Name of Institution.	Meat per week.	Bread per week.	Potatoes.	Rice.	Beans.	Salt Fish.	Indian Meal.	Tea.	Coffee.	Molasses.	No. of persons in each institution.	Solid food per week.
	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	oz.	oz.	gills.		lbs. oz.
Emigrant Refuge, N. Y.	2 8	9 0	0 9	0 1¼	0 2	0 8	1	7/8	3½	*	2361	12 13
Nurseries, Randall's Island, N. Y.	2 6⅜	7 0	*	6	*	4	3	0	0	2½	1384	9 13⅜
Alms House, (males,) N. Y.	5 8	9 8	1 0	*	7	12	0	1/16	2⅝	0	1328	16 12
Alms House, (females,) N. Y.	3 0	8 0	1 0	5	*	12	0	1/16	2⅝	0		13 9
Penitentiary, Blackwell's Island	7 8	8 12	6	6¾	10	0	11	1/16	2¾	4½	790	18 5
Alms House, Philadelphia	2 8	10 8	2 7	6½	0	3	4	7-9	2 4-5	3	1813	16 4
Moyamensing Prison, Philada	*	8 12	*	*	*	*					196	
Eastern Penitentiary, Philada	5 7	8 12	4 0	5	4¾		*	12-14	⅜	5	310	18 12
House of Refuge, Philada	2 10½	12 0	2	6½	*		10	0	1 1-6	3	244	15 13
Maryland Penitentiary	4 11	10 8	2 4			1 12	0	0	3⅜	0	229	19 3
Baltimore Jail	7 00	7 0					0	0	0	0	95	14
Baltimore Alms House	2 5	8 12	1 11	6¾	1½		2 0	1/8	2⅝	2	582	15 3½
Washington Jail	7 00	4 13				1 12	0	0	7	0	30	13 9
Washington Penitentiary	6 00	8 12	8	2		8	0	7/8	3	0	70	15 14
Washington Alms House	3 00	5 0	8			8	0	½	2½	0	79	9 00
Boston House of Correction	7 00	7 0	4 8	*	*	0	2	0	3 1-7	1	450	18 10
Massachusetts State Prison	6 8	10 8	10 8	*	*	12	4	0	7	2	480	28 8
Boston Alms House	2 7⅞	7 0	1 0	2	4	3⅜	0	1/8	0	1	600	11 1⅛
Boston Jail	7 00	7 0	2 10	0	0	0	0	0	3½	¼	110	16 10
Rhode Island State Prison	3 10⅛	7 0	14	0	5	8	2 10	0	1 2-5	3	98	14 15
Providence Alms House	4 2	7 7	8	3	9	5	2 00	1/8	1	2	153	15 2
							oatm'l.					
Pentonville Prison, England	1 12	8 12	7 00	0	0	0	5¼	0	0			17 13¼
							wh. flr.					
U. S. Navy	7 00	6 2	00	1 00	15	0	1 0	1¼	0			16 1
U. S. Army	7 00	7 14		2½					1			15 0
Body Guard of Duke of Hesse Darmstadt												13 8

* Unknown.

The average weekly allowance of food for adults in almshouses and prisons was 14 pounds per person. The most important foods in prison and almshouse dietaries were meat (usually either pork or beef) and bread. Potatoes, rice, beans, salt fish, and Indian meal made up less of the dietary, and sometimes tea, coffee, or molasses were served. The table shows wide disparities in the amount

[162] Ibid., 87.

of food that people in these institutions received. For example, the prisoners at the Massachusetts State Prison ate 28.5 pounds of food a week, while people in the Washington Alms House made do with 9 pounds per week. Most institutions did not limit the quantity of food an inmate could take, and this was particularly the case for bread. Presumably, if there was enough food to go around they could eat to satiety. Yet it is likely that this was not always the case. It was probably easier to get enough to eat at the Massachusetts State Prison, with ample food for 480 inmates, and potentially harder at a place like the Pennsylvania Alms House, where the daily allotment was shared among 1,813 people.

The figures for the Massachusetts State Prison and the Washington Alms House represent the largest and smallest allocations of food of the institutions Gould studied. But the difference accords with a general trend in the dietaries, that the inmates of prisons were fed a larger quantity of food than the residents of almshouses. In more direct terms, this difference in the weight of the food translates to a notable difference in the nutritional status of the inmates. Men in the Massachusetts State Prison ate meat twice a day equaling about 1 one pound of meat per day. By contrast the inmates at the Washington Alms House ate about a half pound of meat per day. Gould thought that neither Boston nor Washington offered sterling examples of a complete and economical dietary, but that the best bill of fare he had examined was the one served at the Emigrant Refuge on Ward's Island, where the paupers received two and a half pounds of meat per week in total, with a meatless day on Sunday. The bulk of the food consisted of nine pounds of bread, served in eight-ounce portions. It is unclear whether this was an adequate diet, though it seems meager.[163]

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[163] Evidence from the study of skeletal remains from almshouses note that most of the adults had no lesions on their bones that might suggest that they had developed anemia or other dietary deficiency disorders, but the bones of women and children suggest that they suffered from nutritional stress, which could have been due to receiving either not enough food or food that was too spoiled to eat. Rosanne L. Higgins, Michael R. Haines, Lorena Walsh, and Joyce E. Sirianni, "The Poor in the Mid-Nineteenth-Century Northeastern United States: Evidence from the Monroe

It is unclear whether the figures Gould collected were accurate representations of the food that prisoners actually received, or even of the average diet at a prison or almshouse. Notably, Auburn Prison and Sing Sing were not included in Gould's survey, and they were two of the most notorious prisons in the state. Gould could not obtain information about the diet at Sing Sing as the prison's administrators had banned the NYPA from its gates in the late 1840s and early 1850s in order to cover up graft and the abuse of prisoners.[164] Corruption could have been widespread at the institutions Gould studied, yet he evinced a curious indifference to that possibility. This is particularly notable given that as a member of the NYPA, a group focused on preventing the abuse of prisoners in New York, he would have been aware that conditions were bad and administrators were untrustworthy at a number of institutions in New England. Prisoners were certainly underfed at Sing Sing, a fact uncovered by one of the NYPA's informants. A former inmate reported to the NYPA in 1851 that inspections such as the ones Gould made were a sham: the wardens had shown healthy and ample provisions to a committee of state legislators who came to visit, and the food was taken away from the prisoners once the inspectors left. The inmates' daily ration actually consisted of a breakfast of wormy salt herring and a dinner of "a small piece of beef or pork, not eatable bread and about four tablespoons of cold beans," the man told the NYPA.[165]

Gould's lack of curiosity about institutional mismanagement and abuse of prisoners may have stemmed from his total faith in the redemptive potential of prisons. In an 1847 visit to Sing Sing before the NYPA was banned from its gates, Gould subordinated his inspection duties to other

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County Almshouse, Rochester, New York," in *The Backbone of History: Health and Nutrition in the Western Hemisphere,* ed. Richard H. Steckel and Jerome C. Rose (Cambridge: Cambridge University Press, 2002), 162–184.

[164] Graber, *The Furnace of Affliction,* 160–61; *Seventh Annual Report of the Prison Association of New-York, including a list of the officers and members transmitted to the assembly, April 10, 1852* (Albany, NY: C. van Benthuysen, 1852).

[165] New York Prison Association Records, January 1845–1846 New York Public Library Manuscripts and Archives Division.

tasks: he spoke to the warden about improved management systems, and he gave a sermon in the prison's chapel urging the inmates to reform. He described looking back at the prison as he left it that evening, when it seemed to him an instantiation of the Inner Light. "Among this Eden-like beauty there stood the dull sullen pile at our feet entombing so many hundreds of our fellow beings, while from every loop hole the light was gleaming out as though a fire was consuming the interior; a fit emblem of this place."[166] As can be seen with Gould's rosy view of Sing Sing, the Quaker doctrine of the Inner Light could serve as both a check on cruelty as well as a blind spot for the excesses of an institution. Quakers thought that an institution must be ordered and kind to allow for self-reform; if the prisoner should experience discomfort in the name of his own improvement, that was not necessarily the fault of the prison system itself so much as that of cruel individual jailors or legislators who turned a blind eye to violent punishments within the jail. As the historian David Brion Davis points out, Quakers had a "gift for assimilating utility and national interest to a humanitarian ethic. ... But they also helped to create a moral climate in which a highly ethical purpose could disguise the effects of power."[167] Though Davis was writing about antislavery Quakers who were also concerned with labor discipline, the same blindness to abuse held true for Gould.

Work, Depression, and Hunger in Jail

Gould was concerned that pauperism was increasing in the United States, and that prudent institutions must be put into place to discourage this form of vice. He saw himself as akin to a physician who had the cure at hand if he knew the magnitude of the illness. As a member of the

[166] Gould, Journal of Residence at Albany, 1847–1850, Gould Family Papers, Cornell.

[167] Davis, *The Problem of Slavery*, 253.

NYPA, Gould was part of the broader transatlantic discussion of how inmates should be treated in almshouses and prisons. He was particularly interested in British reforms, though his enthusiasm for the low diet mandated for British institutions was tempered by his Quaker belief in humane treatment and the views of his fellow prison reformers. Gould intended to preserve the health of the inmates, and so the fact that many were in a low state of health and needed to be cared for was a further check on his impulse to design a low diet for American prisons and asylums.

The British government dealt with pauperism through the passage of the Poor Law Amendment Act of 1834, which created a definitive shift from an older munificence in institutional dietaries to a new austerity, driven by its framers' perception that the rising tide of pauperism needed to be dammed as quickly as possible. The law created a system of workhouses and an administrative structure to oversee them The law abolished the practice of giving direct subsidies to the poor and substituted in its stead employment in a workhouse. A central tenet of the law was that life as a free laborer should be preferable to being an alms recipient. Therefore workhouse inmates should endure conditions, including diet, that were less favorable than the poorest worker in a county, to goad paupers into believing that it was better to labor outside of the workhouse than to reside within it.[168] The diet tables for British prisons were designed on the principle of "the quantity of food should be given in all cases which is sufficient and not more than sufficient, to maintain health and strength, at the least possible cost," as the Home Secretary, Sir James Graham, wrote in 1842.[169] The Poor Law Commissioners conducted a survey of the eating habits of England and Wales in order to determine the average consumption of laborers, as well as to ascertain the local preferences of various

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[168] David Englander, *Poverty and Poor Law Reform in 19th Century Britain, 1834–1914* (London: Longman, 1998), 7, 11–12; Christopher Hamlin, *Public Health and Social Justice in the Age of Chadwick: Britain, 1800–1854* (Cambridge: Cambridge University Press, 1998), 28–32.

[169] Jack C. Drummond and Anne Wilbraham, *The Englishman's Food: A History of Five Centuries of English Diet* (London: J. Cape, 1939, 368.

regions.[170] They found that the British laboring poor ate on average about 9 pounds of uncooked potatoes and a little over 2 pints of milk per day, with no meat. They concluded that this might be the right minimum supply of food for a laborer, presumably based on the fact that people could survive (if not thrive) eating this little.[171] Considering that a workhouse diet was designed to be less than that, it contained very little food, and diseases of malnutrition like scurvy, diarrhea, and general debility were very common among inmates. The Commissioners adopted six different diets; a workhouse administrator could choose the one that he thought would best fit his charges.[172] The most liberal diet in the schedule of diets allowed just under a pound of meat a week and 5.25 pounds of bread, 2 pounds of potatoes, and 8 ounces of cheese. However workhouse inmates did not always receive the food allotted to them by the official diet, primarily due to the fact that administrators could cut back on the dietary at will; for example, making the pudding with broth rather than suet, or withholding food as a punishment.[173] The decline in the health of prison inmates provoked some backlash against the new restricted diets but the views of men who thought that the poor had been coddled for too long, like the industrialist Andrew Ure (whose chemistry treatise Gould had read) and the Utilitarian sanitary reformer Edwin Chadwick, prevailed, and the punitive diet was approved.[174] Pereira, Gould's likely source for information about the Poor Laws, disapproved of the mandate of a punitive diet for workhouses. He did not think it was right to use

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[170] Ian Miller, "Feeding in the Workhouse: The Institutional and Ideological Functions of Food in Britain, Ca. 1834–70," *Journal of British Studies* 52, no. 04 (October 2013): 940–62, doi:10.1017/jbr.2013.176; Valerie J. Johnston, *Diet in Workhouses and Prisons, 1835-1895,* British Economic History (New York: Garland, 1985), 18; Pereira, *A Treatise on Food and Diet,* 241.

[171] Gould, *A Report on Food and Diet*, 29.

[172] Pereira, *A Treatise on Food and Diet*, 240.

[173] Miller, "Feeding in the Workhouse," 948.

[174] Drummond and Wilbraham, *The Englishman's Food*, 364.

an institution to extract the debt that a prisoner or pauper owed to society, and he denied the common charge that a good diet in a prison was an inducement to crime.[175] However, Pereira approved of the diet adopted by many British prisons, which was low by contemporaneous American standards.[176]

A similar shift from sufficiency to austerity in the diets of prisons and asylums was occurring in the United States in the same period, yet the distinctive history of American prison reform meant that it took a different form. Many American prison reformers argued that prisons needed to be humane and redemptive places, though what that entailed in practice varied widely. The reformers' efforts were blunted by state legislatures, which did not see the point in rehabilitation; prison wardens, who did not want meddling do-gooders poking around their prisons; and prisoners themselves, many of whom resisted being reformed. Calvinist reformers in the 1810s and '20s thought that prisons should be made more rigorous in order to enforce discipline; consequently American prisons in the 1820s and '30s were violent, harsh places. By contrast, Quakers thought that prisons should be a "garden for rehabilitation," as the historian Jennifer Graber has put it, where prisoners would experience the redemptive virtues of decent treatment, silence, and solitude. Quakers like Gould, Griscom, and the New York banker Issac Hopper were the backbone of the NYPA, which dominated the debates about prisons in New York State in the 1840s.[177] They believed that people turned to crime because of insufficient education and bad living conditions. Society was

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[175] Pereira, *A Treatise on Food and Diet,* 224, 247.

[176] Ibid., 245.

[177] Graber, *The Furnace of Affliction*, 4–7, 145; Michele Lise Tarter and Richard Bell, eds., introduction to *Buried Lives: Incarcerated in Early America* (Athens, GA: University of Georgia Press, 2012).

at least partially responsible for the degraded moral condition of the criminal, and therefore had the responsibility of treating him humanely with the hope that he would reform himself.[178]

The focus on the individual criminal as the seat of social ills was the reason why the NYPA saw one of its primary roles as helping discharged prisoners on an individual basis. Though the group won the right to conduct prison inspections and make reports to Albany, their influence was more akin to that of a lobbying group than an official state agency. The NYPA received no state funding, its inspectors were frequently denied entry to institutions by the official state prison inspectors, and their annual reports languished unread by the politicians and newspaper editors who received them. In practice, their activities were limited to collecting reports and helping individuals who had been released from prison to find jobs and stay out of trouble.[179] After hearing reports from released criminals that the conditions were miserable and violent in Sing Sing and other institutions, the NYPA's mandate later expanded to advocating for improved conditions in prisons. An attempt to know the individual prisoner and what might make him reform was considered essential by reformers like Gould for the proper functioning of the institution, and the prison or almshouse dietary was an important part of this calculation. Physicians of the period held that the healthfulness of a particular diet hinged on a person's habits and constitution. Profession, gender, age, activity level, and climate were all considerations that might influence what food was good for a person. One might make broad generalizations as Luther Bell did when he advised the workers of New England on what to eat, but he did not go so far as to prescribe set quantities of food. Gould, too, knew that nutritional chemistry could approximate the amount of food needed by a person, but

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[178] M. J. Heale, "The Formative Years of the New York Prison Association, 1844-1862: A Case Study in Antebellum Reform," *New York Historical Society Quarterly* 59, no. 4 (1975): 332; Adamson, "Evangelical Quakerism and the Early American Penitentiary Revisited."

[179] New York Prison Association Records, November 1846–January 1852, New York Public Library Manuscripts and Archives Division.

it could not account for the vagaries of lifestyle with any specificity. This was not a problem for free people who could choose their own food, but people in institutions had to eat whatever was put in front of them, regardless of whether it suited their unique characteristics. Assuming that a single diet could nourish all people equally was a mistake that "would lead to the most disastrous results," Gould wrote.[180]

Yet who was a prisoner, and how might a diet be designed to keep him reasonably healthy? The crux of this problem was expressed by Gould's friend, the sanitary reformer John Hoskins Griscom, in an 1868 essay published in the annual report of the NYPA.[181] In it, Griscom described prison medicine as its own science, dedicated to taking care of prisoners, who were a "class of beings *sui generis"* because they were not free: they could not choose what was healthy in terms of food, clothing, and housing, and they were denied the health-giving pleasures of liberty. Instead, a convict must align himself with the unvarying routine of the institution.[182] The uniform regimen of a prison should not be expected to keep everyone in a healthy condition, no more than a single diet would suit a group of free people:

> If in social life, among the members of a family or a community, whose habits, occupations, and educations are very similar, we discover such a variety of requisitions for food of different qualities and amounts, it is reasonable in a community of 500 to 1000, drawn from as many different families, from a dozen different nations, from every station in life, with every variety and shade of education and complexion, from the ages of 16 to 60, of both sexes, to expect such a similarity or elasticity of organization as will accommodate all to the Procrustean dietary of a prison?[183]

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[180] Gould, *A Report on Food and Diet,* 6.

[181] John Hoskins Griscom, *Prison Hygiene: An Essay Prepared at the Request of the Prison Association of New York, for Insertion in Their Twenty-Third Annual Report, and Reprinted by Their Order* (Albany: van Benthuysen, 1868).

[182] John H. Griscom, "Essay on Prison Hygiene," in *Twenty-Third Annual Report of the Executive Committee of the Prison Association of New York, and Accompanying Documents for 1867* (Albany: Benthuysen & Sons, 1868), 44–64.

[183] Ibid., 47.

Though Griscom did not (and could not) offer a single dietary to suit prisoners, he did give broad guidelines for feeding the type of person who was in prison. For Griscom, labor was the primary consideration for choosing an institutional diet. Men who were set to hard labor needed coarser food like beef, potatoes, and salt pork in copious amounts, and people who worked less, ate less. But extra food would also protect convicts against the emotionally and physically debilitating effects of incarceration. An imprisoned person was depressed, and therefore prone to illness. As his depression made it more difficult for his body to assimilate nourishment, the stimulus of more food was needed to protect his health.

Pereira, too, cited labor and depression as the primary considerations when trying to design a prison diet. As the body cannot make its own nutrients, enough food must be provided to support the body in health rather than simply the amount that would match what a free laborer might get. "For the question is, not what the honest laborer can obtain but what is necessary for the prisoner," he wrote.[184] A prisoner's condition of life required wholesome diet, Pereira wrote; deprive a man of his liberty, keep him from talking to others, and make him work at hard labor, and you depress him body and soul. Therefore, the food in institutions ought to be well above the starving point, with plenty of meat: prisoners needed the stimulus of animal food to keep from contracting low and debilitating diseases. Men who were condemned to long prison sentences ought to have more substantial diets containing larger portions of meat and vegetables. As the British physiologist William Carpenter wrote in the early 1850s, the depressing influence of confinement weakened inmates' powers of digestion. In contrast to Pereira, he did not think that more food was needed, just some variety in the diet to counteract the effects of imprisonment.[185]

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[184] Pereira, *A Treatise on Food and Diet*, 247.

[185] Carpenter, *Principles of Human Physiology,* 385.

Gould agreed with Griscom and Pereira that knowing both the type of person an institution housed and the kind of labor he would be asked to perform were the two most important considerations when thinking about diet. This was a useful rule of thumb for designing institutional dietaries, as inmates had a uniform mode of living and tended to conform to certain types. From there one could approximate a diet that would keep such a group of people in good health. This was why Gould gave no absolute standard for how much carbon and nitrogen a person should eat daily. In its stead he offered sample dietaries and broad guidelines for how to design a diet. Its proper application would have to depend on an intelligent and conscientious administrator, who would know the health condition of his charges and choose the diet carefully in order to maintain their health. Gould described a few composite portraits of dietetic types that would need particular diets. For example, the people housed in the Emigrant Refuge were very ill, weakened by hunger, and sick with typhus, dysentery, or ship's fever from filthy and crowded conditions on board passenger ships. Griscom, who tended the sick at the Emigrant Refuge, claimed that roughly 70 percent of the immigrants were ill when they arrived.[186] The Irish were presumably even sicker due to the terrible conditions they had fled from in their native country. Gould wrote that the immigrants needed enough food to repair their wasted tissues; it had to be high-quality food as well, so as not to overtax their weakened powers of digestion. The insane were likewise delicate and needed a fairly rich diet to buttress their fragile bodies. By contrast, prisoners were often robust men who also worked at hard labor; their iron-clad digestive systems could digest almost any food in "quantities which would well neigh cause the death of the feeble pauper at the Refuge."[187] Curiously, racial thought did not seem to enter into Gould's list of considerations, despite the fact that the Irish immigrants who were

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[186] Diary of John Hoskins Griscom, New York Historical Society Main Collection.

[187] Gould, *A Report on Food and Diet,* 7.

housed at the Refuge were considered by many of this period to be of an inferior race. Nor did Gould consider African Americans to have distinct constitutions that would require a particular diet, as did Southern slave owners.[188]

Gould observed that every chief superintendent he spoke to assured him that inmates left their prisons and almshouses in a much better condition than they arrived in. Gould strenuously objected to this fact; he thought that prisoners should not become healthier when incarcerated. Instead, prisons ought to be an instrument of moral reform that would help alleviate the social problems of the day: intemperance, poverty, crime, and vice of all kinds. Since crime came from immorality, moral reform was the way to attack the root cause of the problem. It was vitally important for Gould that the diet in prisons and almshouses not actively harm the inmates, but not help them too much either, lest vice and crime be encouraged. As Gould put it, "The great body of the laboring classes do not obtain food enough to increase their weight, and I believe the united experience of all nations shows that it is a capital error to feed paupers and prisoners *better* than the corresponding class in society who rely on their own exertions for support."[189]

For Gould, this left the question of how to make a diet that did not starve the inmates, but also did not indulge them in the slightest. Cooking was one way to do so. The meat served to inmates should be boiled or steamed, but not roasted, as roasted meat was much tastier than

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[188] At least one Southern physician advised that slaves had feeble powers of heat generation, and therefore needed a surplus of heat-producing foods, like fat bacon and pork. Sugar and molasses were also proven foods for slaves, as the author noted that the Louisiana sugar plantation slaves always remained fat, even during the hard labor of sugar season. It goes without saying that slave owners failed to consider depression as a factor in designing a diet for the people they held in bondage, nor did they consider that the staple diet of cornmeal, fat meat, and occasional milk and garden vegetables may have been insufficient. See, e.g., Robert J. Draughon, "Provisions for Field Hands," *Southern Cultivator* 8 (January 1850): 4. Reprinted in James O. Breeden, ed., *Advice Among Masters: The Ideal in Slave Management in the Old South* (Westport, CT: Greenwood Press, 1980); J. S. Wilson, "Peculiarities and Diseases of Negroes," *DeBow's Review*, May 1860, 597; Todd Savitt, "Slave Health and Southern Distinctiveness," in *Disease and Distinctiveness in the American South,* ed. Todd Savitt and James Harvey Young (Knoxville: University of Tennessee Press, 1988), 136; Kenneth F. Kiple, *Another Dimension to the Black Diaspora: Diet, Disease, and Racism* (Cambridge: Cambridge University Press, 1981), 72; Kenneth F. Kiple and Virginia H. Kiple, "Slave Child Mortality: Some Nutritional Answers to a Perennial Puzzle," *Journal of Social History* 10, no. 3 (Spring 1977): 284-309.

[189] Gould, *A Report on Food and Diet,* 24. Emphasis in the original.

steamed meat. Roasted meat could be served as a reward for good conduct or dished out "on some of the great festivals where all desire that the poor and even the guilty should participate in the general rejoicing," he noted primly.[190] However, Gould thought that deciding how much food a prisoner received would require empirical investigation to get right. Gould wanted inmates to be weighed when they were admitted to the institution, and for them to be weighed again after they had spent six months or so imprisoned. If they had gained weight, their diet was excessive. Unfortunately for Gould, only the New York Alms House and the Maryland Penitentiary weighed their charges, and so he could only make this calculation for those two institutions. While the Maryland figures were inconclusive—some inmates gained weight, others lost—Gould thought that the paupers in the New York Alms House got too much to eat. The superintendent of that institution noted the weight of 288 paupers upon admission, and weighed them again when they were discharged. Each person gained weight while inside, on average from 2.5 to nearly 10 pounds. Gould did not consider that these people might have not gotten enough to eat before they entered the almshouse and so were underweight to begin with. He believed that the fact that paupers gained weight while inside meant that they were being overfed and the diet could be reduced.

But how to reduce the diet safely? Gould thought that a balance trial—a chemical analysis of both dietary intake and an analysis of excrement—would answer this question. This sort of trial had been conducted by Boussingault in the late 1830s on a cow and a horse, an account of which Gould was likely to have read.[191] Gould provided some of the tools for an asylum administrator to conduct his own balance trial in that he published Boussingault's table showing the nitrogen and carbon content of common foodstuffs. The actual chemical analysis of inmates' excreta was of course not

[190] Ibid., 43.

[191]Carpenter, *Protein and Energy*, 37.

something that one could do by reading a table; one had to have a chemical laboratory, a trained chemist, and the ability to coerce subjects into giving samples. Nor could an administrator discern whether inmates were eating too much carbon or nitrogen by simply weighing them. To find out which nutrient was deficient or in excess, one had to compare its amount in the food to its amount in the excretions. If the nitrogen received in the food exceeded the amount in the excretions, the inmate ate too much meat. If there was more carbon in the food than the excretions, he ate too much bread. Gould acknowledged that technicians who knew enough chemistry to conduct this analysis were not commonly found employed in American prisons and asylums. "To ascertain the amount of nitrogen in the excrements would require a greater amount of chemical skill, and greater delicacy of manipulation, than could be secured by the greater number of institutions in this country," he wrote, though he hoped that an institution in one of the larger cities, such as New York, Philadelphia, or Boston, would undertake this kind of analysis. At minimum, Gould advocated that each prison or almshouse keep a register recording each inmate's name, age, height, and weight on admission, as well as the results of monthly weight checks, occupation before and after entrance, and the capacity of the chest.[192]

Gould's belief that an almshouse or penitentiary was an instrument of moral reform extended to its dining rooms and dining room furniture. His view on this question likely stemmed from debates among prison reformers about how best to prevent inmates from corrupting one another. The approach at Philadelphia's Eastern State Penitentiary was strict solitary confinement. This was called the Philadelphia system or separate system, and it was a prison arrangement that alarmed some reformers as it drove inmates insane. Quaker prison reformers like Thomas Eddy, a wealthy New York Quaker and prison reformer who founded Newgate Prison in New York City in

[192] Gould, *A Report on Food and Diet*, 67.

the late eighteenth century, advocated a less harsh approach: that the inmates work together in strenuous but not excessive labor by day, and then sit in solitary confinement by night, so that the silence could help a prisoner reform himself.[193] This system came to be called the Auburn system, after the New York prison of the same name. The NYPA supported this system, which separated hardened criminals from younger and comparatively uncorrupted ones, and ensured that inmates did not converse by keeping them on a strict schedule of work, study, eating, and sleeping.[194]

Likewise, Gould disapproved of prisons that allowed inmates to mix freely. In the service of this goal, Gould held that dining rooms should be arranged with stools on one side of wooden tables so people would eat together but not talk to one another. Large almshouses should have dining rooms that were segregated, so that men and women did not eat together, and people who come from the better classes did not eat with the lower orders. Gould did not like to see people who had occupied high places be made to eat with "negroes and white persons of the lowest character, whose filthy habits and disgusting conversation added to the bitterness of the cup which was given to these fallen ones to drink of."[195] By the better classes, Gould meant men and women who had become poor through accident or unavoidable misfortune. Their food should not be different, but they should sit down to a nicer table, similar to one that a respectable laborer would have. This was the arrangement at the Philadelphia Almshouse: the deserving poor sat at tables spread with white cloth, and they ate off of white ceramic plates, with knives and forks, and had butter and good tea. By contrast, Gould thought that the lower classes would not appreciate a nicely set table—they were,

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[193] Graber, *The Furnace of Affliction*, 30–32.

[194] Beaumont and Tocqueville, *On the Penitentiary System in the United States,* 35; *Ninth Annual Report of the Prison Association of New-York* (Albany: C. van Benthuysen, 1854), 42.

[195] Gould, *A Report on Food and Diet*, 44.

in fact, unworthy of it thanks to their filthy habits and disgusting conduct—and so they should have tin plates and spoons, and no butter.

Work was an essential engine for individuals' reform, as well as a means for balancing an institution's budget. At the Emigrant Refuge on Ward's Island, Gould recommended that the skilled workers among the immigrants, the shoemakers and tailors, be given the tools of their trades and set to work. Unskilled children and adults ought to be taught to weave corn husk mats and straw hats, as weaving was a simple task, easily learned, and not too taxing for people who were feeble. He also thought that the land at Ward's Island should be used to grow vegetables for sale. Paupers were very well suited to horticultural labor because it required no special knowledge to pull weeds or spread manure. He recommended the cultivation of dainty vegetables such as asparagus, rhubarb, strawberries, and melons, as they could be sold at high enough prices to offset the cost of running the Emigrant Refuge.[196]

Gould struck an urgent tone in describing the importance of managing the poor population of New York City, likening poverty and crime to an illness that threatened the health of the body politic. The establishment of proper workhouses was utterly necessary if the state and city were to stem this rising tide of poverty and crime, echoing a view that was part of the broader international prison reform movement.[197] "Pauperism is *increasing* amongst us in a *fearfully* increasing ratio," he wrote.[198] Others in Gould's reformist circles saw themselves as akin to physicians who knew both the diagnosis and the cure for this disease. "The perpetration of one crime does not necessarily imply an endless progression in that direction, [therefore] we would treat it as a disease which though dangerous, offers with a proper remedy a fair prospect of cure," according to an unsigned editorial

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[196] Gould, *A Report on Food and Diet,* 65. Emphasis in the original.

[197] Hamlin, *Public Health and Social Justice,* 22–23.

[198] Gould, *A Report on Food and Diet,* 70.

in the 1853 NYPA annual report.[199] Prisons were one such avenue for helping to cure society of this illness, but they were a dangerous one. Francis Lieber, the American political philosopher and translator of Gustave de Beaumont and Alexis de Tocqueville's report on prisons, described prisons as a "moral lazaretto" to contain crime. Like quarantines, prisons represented both safety and danger. They kept criminality from infecting society, but also dangerously harbored a reserve of lawlessness within their walls.[200]

Gould's vision of crime as a pox on the body politic meant that reformers like himself had to take decisive action. As if the malady of crime needed a reformer who was like a scrupulous physician Gould emphasized the importance of preventative measures. "How much more useful would be our labors if we could meet the malady [crime] in its earlier stages, or better if we could prescribe prophylactics which would entirely prevent its appearance?" he asked. He proposed the passage of laws that would control the sources of civic mischief: drinking, brothels, the theater, gambling, poverty, and ignorance. In keeping with the general model for statistics in antebellum America, Gould's crime statistics were a means for describing the natural laws at work in society that gave rise to aberrations like crime and vice.[201] Just as a physician must learn physiology before he learns pathology, reformers who wished to make prisons into effective instruments of reform had to understand the true causes of criminal behavior, Gould wrote.[202] For Gould and other reformers of the era, the analogy between crime and illness was more literal than metaphorical, as crime was essentially caused by a derangement of one's moral faculties. A society composed of individuals with sound morals would add up to a healthy society, and one with low morals an unhealthy one; it was

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[199] *Eighth Annual Report of the New-York Prison Association* (Albany: C. van Benthuysen, 1853), 10.

[200] Francis Lieber, introduction to Beaumont and Tocqueville, *On the Penitentiary System in the United States.*

[201] Dorothy Ross, *The Origins of American Social Science*, 60.

[202] Gould, Appendix A in *Annual Report of the New York Prison Association,* 1855, 47–123.

much easier to prevent this latter problem than to fix it. "As in the physical, so in the moral world, the philosophy of Hygiene is much better understood and more easily applied, than the philosophy of Therapeutics," Gould wrote in 1847.[203]

Just as dietary treatments were often the first recourse of a physician treating an organic disease, diet could form part of the moral treatment of a prison or almshouse. The general theory behind institutional provisioning at American institutions in the mid-nineteenth century was marked by the fact that they were intended as preventative measures against crime and vice, rather than punishment for past misdeeds. Figures on institutional diets collected by the moral reformer Robert Hartley, who had founded the New York Association for the Improving the Condition of the Poor, matched the figures given by Gould, underscoring how distinctive certain American institutions were in this period with regard to the care and feeding of the underclass in the early 1840s.[204] On paper (if not always in practice) these American institutions were marked by their generosity compared to their British counterparts. The liberal diet of the Boston House of Correction was a case in point, as it offered inmates bread and beef of the finest quality, and more bread if prisoners wanted it, in the name of good order. "All experience teaches that men can be easily governed when they are well fed," wrote a Dr. Smith in the *Boston Medical and Physical Journal*, reprinted by Lee. "It is a sad mistake that the convicts in many of the Penitentiaries of this country are kept at that exciting point of hunger, which changes man into a devil in feeling, and a brute in conduct."[205]

Gould's diet for prisons and asylums was designed to hit a moral minimum, as he could not determine a physiological one. That being said, he retained an interest in the benefits of parsimony

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[203] Gould, "Sources of Crime," in *Annual Report of the New York Prison Association*, 1847, 70–71.

[204] Pereira, *A Treatise on Food and Diet*, 312. This section was from an appendix written by Pereira's American editor, Charles Lee, about American dietaries.

[205] Pereira, *A Treatise on Food and Diet*, 316.

in institutional dietaries, though without any concrete ideas about how to reduce the diet. Other Americans were coming to similar conclusions. Despite advocating a certain amount of liberality in an 1843 essay on institutional dietaries, Charles Lee also noted the downside of munificence in almshouse administration. "The effect of this generous mode of living [in almshouses], though highly favorable to health, is expensive, and renders an almshouse residence, especially during the winter, quite desirable to a large class of our city poor," Lee wrote, arguing that the whole almshouse system needed to undergo a radical change.[206]

In his 1852 *Report on Food and Diet,* Gould hoped to be able to find a way to feed prisoners and paupers as little as possible. Its saving grace for the workhouse and prison inmates was the fact that Gould could not determine what the actual limit was. On the one hand, this was a simple scientific problem that Gould thought he ought to have been able to solve by relying on new ideas in agricultural chemistry. However, the nascent state of the science had provided only the first short steps toward being able to provide a physiologically accurate dietary standard. Yet the deeper and more intractable problem for Gould and others looking to find a dietary minimum was conceptual: not all people had the same needs and requirements, and so Gould held that a maintenance ration was not possible to compute. Gould's framing of nutrition as a social question was to use it as a way to discern how much society could afford to feed the prisoners and paupers in its midst, a question he chose to interpret on physiological and moral grounds; diet, in his eyes, was a way to help both individual sinners and society as a whole maintain their salutary equilibrium. If reformers like Gould monitored society with the same care that physicians tended the health of their patients, then Gould intended to establish the regimen most conducive to health.

[206] Ibid., 312.

Chapter 3: A Science of Improvement?: The Debate Over Eben Norton Horsford's Marching Ration for the Union Army

Near the end of the Civil War, Amos Eaton, the acting Commissary General of the Union Army, fielded a query from US legislators about the food that his office provided for the soldiers. The Congressional Committee on the Conduct of the War asked Eaton if he could find a way to make the army ration (or devise rations) lighter and more portable, both to save money and to allow the soldiers to pursue the Confederate Army with greater speed. Eaton agreed that the army's methods for provisioning soldiers on long marches needed to be changed, as they were slow and wasteful. In preparation for a march, the men would be issued three to eight days' worth of cooked meat and hard bread (hardtack), which they carried in their haversacks and ate while on the move. "The rations, after being thus held for some days, become sour or musty, and not being wholesome are condemned and necessarily replaced by another issue," Eaton wrote the committee in 1864. He mused about whether an imperishable marching ration could be devised: one that could be carried by the soldier, eaten on the march, and then returned to the commissary if it went unused. He recommended that a board of army officers be convened to evaluate proposals from "persons skilled in preserving food" to create such an imperishable marching ration.[207]

The man Eaton found to lead this project was Eben Norton Horsford (1818–1893), a chemist and entrepreneur from New England. As noted in chapter 2, in the mid-nineteenth century chemists were at a high-water mark in their confidence about their discipline's capacities for scientifically identifying people's nutritional needs. Horsford would take this confidence a step farther, in his claim to having designed a condensed meat and bread ration that was optimally small

[207] Amos B. Eaton to B.F. Wade, March 12, 1864. Folder Horsford EN (Prof) (1864–65) marching ration. Records of the Office of the Quartermaster General, Consolidated Correspondence file 1794–1915 RG 92 Entry 225 Box 844 National Archives. Hereafter National Archives.

and light, yet contained all of the nutrients needed daily by a soldier. While Gould was largely a self-taught chemist, Horsford had received professional training at the best lab to do so in his time: he had studied with Liebig at Giessen in the 1840s, and later taught chemistry as the Rumford Professor of Useful Arts at Harvard University. After leaving academia he reinvented himself as an inventor, by creating and marketing a chemical leavening for bread, in a clear instance of how chemistry could improve food and diet. In designing his ration, Horsford drew on chemists' attempts to discern how much food would be needed to support a certain amount of labor. His faith in the power of chemistry to improve human diet matched both Liebig's and the American agricultural press's confidence in the science. For military leaders, Horsford painted an attractive picture: If soldiers' dietary requirements could be exactly delineated by chemistry, optimal military efficiency could theoretically be reached, and the soldiers' nutrition could be counted as precisely as boots or guns or cannonballs.

Yet Horsford's confidence in chemistry as the means for improvement in nutrition met with resistance from the physicians of the Army Medical Department, who exercised their profession's skepticism towards a universal dietary standard. As described in the previous chapter, experts on nutrition in the 1850s had begun to delineate how chemistry could be used to make institutional dietaries, but their ambitions had been kept in check by medical concerns about the unsuitability of a single diet for all people. Army doctors exercised a similar function in the debate over Horsford's ration. The fact that the physicians of the Army Medical Department Army doctors were not fully on board with a scientific proposal was, on the surface, a curious one. The Army Medical Department was a wing of the scientific vanguard in the US, pledged to science as part of a conscious effort to improve American medicine. In doing so, they developed new frameworks and institutions for the study of physiology, pathology, and chemistry, as well as new techniques in

surgery and the control of infectious diseases.[208] Army physicians' efforts to document, classify, and record illness were helping to bring about the intellectual shift in medicine that was taking place at the mid-nineteenth century, from a model of disease as fundamentally a product of an individual's systemic imbalance toward a model that saw disease as the sum of uniform symptoms that could be treated with the same methods in any person ill with that disease.[209] This was a change that paralleled the universalizing trend in nutrition science, which was pushing toward the notion that a dietary standard could be devised to meet all people's needs. Horsford's ration was fully within that trend, as he argued that Union soldiers' nutritional requirements were similar to the requirements of soldiers in foreign armies, and each could be quantified using chemistry.

Yet the resistance of army doctors to Horsford's ration project suggests that they thought nutrition lay outside the boundary of what science could explain. For army doctors, chemical knowledge about food and metabolism did not give a full picture of a person's nutritional needs. Far more to the point were tradition and habit: what the soldier wanted and expected to eat was a far better indicator of how to keep him healthy than chemistry ever could be. All the same, army physicians evaluated the ration proposal seriously. This is important to note in light of the few historians who have written about Horsford's ration, who have reasoned backwards from the fact that the project was a failure to assume that army doctors rejected it because it was an inherently

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[208] Shauna Devine, Learning from the Wounded: *The Civil War and the Rise of American Medical Science,* Civil War America (Chapel Hill: University of North Carolina Press, 2014); Margaret Humphreys, *Marrow of Tragedy: The Health Crisis of the American Civil War* (Baltimore: The Johns Hopkins University Press, 2013); Alfred Jay Bollet, *Civil War Medicine: Challenges and Triumphs* (Tucson, Arizona: Galen Press, 2002); Kathryn Shively Meier, "US Sanitary Commission Physicians and the Transformation of American Health Care" Lorien Foote and Kanisorn Wongsrichanalai, eds., *So Conceived and so Dedicated: Intellectual Life in the Civil War-Era North*, First edition., The North's Civil War (New York: Fordham University Press, 2015) 19-40.

[209] John Harley Warner, "From Specificity to Universalism in Medical Therapeutics: Transformation in the 19th-Century United States," in *Sickness & Health in America: Readings in the History of Medicine and Public Health,* 3rd ed. (Madison: The University of Wisconsin Press, 1997), 87–101.

terrible idea.[210] It was certainly the case that the ration failed its field trial; soldiers and officers who found it to be usually spoilt on arrival in their camps, and insufficient food to make up a meal when it was sound. However, the notion that the food might spoil was not part of the physicians' initial resistance to the ration. Instead, the debate over Horsford's ration was about the ambitions of chemistry as a science of improvement in nutrition and its limitations.

The debate between Horsford and the army doctors illuminates another facet of nutrition as it developed at midcentury: the rising importance of technical expertise in designing diets, both in the persona of the scientist and the specific ideas he offered. While Gould's status as a nonprofessional reformer and self-taught scientist was acceptable to the Commissioners on Emigration fifteen years earlier, Horsford's status as an expert in the eyes of the government and army rested on his professional training. Yet as a transitional episode in the development of nutrition as a social question, this expertise was not water-tight; it was open to challenge from physicians who doubted its value. The notion of social amelioration is also not present in Horsford's debate with the doctors. Though he was a temperance man and had once considered a career in the clergy, Horsford was no moralist; instead, his faith was primarily in scientific progress. The fact that moral concerns were not foremost in considering the diet of soldiers was not an indication that such concerns had faded in the 1860s. Instead, it must be seen as a reflection of nutrition scientists' shift in focus from people to be pitied and corrected, like paupers and prisoners, to soldiers, who were an avatar for the nation during wartime and deserved ample food. Feeding soldiers was a patriotic duty, and not one stemming from an interest in reforming the more wayward segments of the population.

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[210] Samuel Rezneck, "Horsford's 'Marching Ration' for the Civil War Army," *Military Affairs* 33, no. 1 (April 1, 1969): 249–55, doi:10.2307/1984484; George Worthington Adams, *Doctors in Blue: The Medical History of the Union Army in the Civil War* (New York: Henry Schuman, 1952).

The central thrust of this chapter is an analysis of a crisis in the legitimacy of science for casting nutrition as a social question, centering on the question of whether a universal dietary standard could be developed that would suit the needs of Union soldiers. In this chapter I first detail the problem of Army rationing, showing the difficulty of getting fresh food to the soldiers and examining some attempts to improve it through the creation of portable foods that met American soldiers' particular dietary needs. Second, I explore Horsford's education and his work inventing a chemical leavening for bread, to show how his training and previous experience as an inventor informed his ration design. Third, I analyze Horsford's plan for the ration, showing how his design drew on a nascent consensus among chemists about how to account for individuals' nutritional requirements. Finally, I outline Horsford's campaign in Washington to get his ration accepted by the army, and analyze the Army Medical Department's objections to the ration as they asserted medicine's right to be the central arbiter of the health of the soldier.

Provisioning the Army in the Field in the Civil War

The US Army ration had long consisted of a set quantity of meat and bread, with supplemental rations of beans, tea and coffee, and condiments like salt and vinegar. At the outbreak of the war, the daily ration consisted of 22 ounces of bread or flour and 12 ounces of pork or bacon. One pound of hardtack could replace fresh bread, and 1 pound of fresh or dried beef could stand in for the pork. There were also bulk rations of beans, potatoes, rice or hominy, coffee, tea, sugar, vinegar, molasses, and salt and pepper to be split among every company (100 men). On the march, soldiers were issued 1 pound of hardtack and ¾ pound of salt pork, or 1¼ pound of fresh beef, plus sugar, coffee, and salt.[211] Commanding officers were allowed to issue fresh meat as often

[211] Erna Risch, *Quartermaster Support of the Army: A History of the Corps, 1775–1939*, 2nd ed. (Washington, D.C.: Center of Military History, United States Army, 1989), 449.

as they thought prudent, to give the men variety in the diet.[212] The choice of food provided and the amounts had been set by custom and statute rather than any kind of empirical inquiry, so that even William Alexander Hammond, the surgeon general in the first half of the Civil War, could not explain why 12 ounces of pork was considered equivalent to a pound of beef.[213]

Soldiers were not always guaranteed a consistent supply of bread and meat, particularly at the start of the conflict in 1861. The rapid mobilization of troops—which swelled from about 16,000 soldiers to half a million men in the fall of 1861—was far too fast for the twelve officers comprising the Commissary General of Subsistence to keep up with.[214] The federal government initially had to rely on state militias and better-funded private organizations like the US Sanitary Commission to keep troops fed as best they could.[215] Once an expanded Commissary Department was up and running, it bought rations by awarding contracts to manufacturers in the larger cities near the theaters of war. For example, western troops were supplied from St. Louis, Louisville, and Cincinnati, while the Army of the Potomac received food from Boston, New York, Philadelphia, and Baltimore. The department also ran its own food production, with regional corrals for cattle, pickle- and pork-packing plants, and bakeries for fresh bread and hardtack.[216]

Even after the Commissary Department became able to ensure a consistent supply of food, it faced logistical challenges in getting it to soldiers. It was not an easy task to maintain an unbroken

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[212] "To Correspondents," *Medical and Surgical Reporter* (1858–1898) 6, no. 26 (September 28, 1861): 582.

[213] William Alexander Hammond, *A Treatise on Hygiene : With Special Reference to the Military Service* (Philadelphia: J.B. Lippincott & Co., 1863), 511; John Stanton Gould, *A Report on Food and Diet, with Observations on the Dietetical Regimen, Suited for Almshouses, Prisons, and Hospitals; Also on Heating, Ventilation, &c., with Practical Recommendations* (New York: W. C. Bryant, 1852), 8.

[214] Risch, Quartermaster Support of the Army, 339–40.

[215] James A Huston, *The Sinews of War: Army Logistics 1775-1953,* Army Historical Series (Washington, D.C.: Center of Military History, United States Army, 1966), 184–185.

[216] Ibid., 185.

supply line of food, clothing, ordnance, medical supplies, fodder for pack animals, and everything else needed by 100,000 men on the march. The armies fighting in Tennessee and Missouri were subject to food shortages more frequently than the army in Virginia because of the distance and difficulty of moving supplies through the large Western theater: a pack train might be delayed by active fighting, speedy troop movements, hostile civilian populations, or Confederate cavalry raiders. Almost every regiment went hungry once in a while, or subsisted on short rations of only dried meat, hard bread, and coffee.[217]

Soldiers generally cooked for themselves, often without knowing how to make palatable food from their provisions. The men cooked their meals over a campfire using a single pot or frying pan. The meat, usually pork, was eaten boiled, fried, or broiled on a stick over the fire, baked with beans, or incorporated into a stew. Salt beef, or "salt horse" in the solders' parlance, was salted so heavily that it had to be soaked before it was eaten. It was so vile that seasoned troops would not eat it.[218] Fresh beef was slaughtered by butchers in camp, but unless the meat was butchered and eaten quickly, it could make men sick. Hardtack crackers, dubbed "worm castles," were the most common bread ration. They were made of flour and water mixed together and dried in a kiln. They were essentially imperishable, though they could spoil when exposed to water or insects. Men would eat their ten crackers a day by crumbling them into coffee, soup, or milk; frying them in salt pork grease; or beating them into a powder to make griddle cakes. Care had to be taken to expel the maggots or weevils that frequently infested hard bread, which could be done by toasting it over a fire.

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[217] Bell Irvin Wiley, *The Life of Billy Yank, the Common Soldier of the Union, 1st ed.* (Indianapolis: Bobbs-Merrill, 1952), 225, 227–28.

[218] John Davis Billings, *Hardtack and Coffee: Or, The Unwritten Story of Army Life,* 2nd ed. [1st ed. 1887], The Lakeside Classics (Chicago: The Lakeside Press, 1960), 136.

As soldiers were fed mostly bread and meat, the monotony of the diet sometimes led to illness, most often chronic diarrhea and scurvy.[219] In 1862, a surgeon for the Nineteenth Regiment of Massachusetts Volunteer Infantry complained that his soldiers ate fresh beef only twice a week, with no beans, rice, vegetables, or molasses. "With all the talk about the bountiful provision for the army, it is well known that this army, at any rate our division, have had potatoes but six times since last February," he wrote in his diary. "If the men had not, in spite of orders, stolen all the vegetables they could get (from the ground) not one would have escaped scurvy."[220] It was generally accepted that a lack of vegetable food would create the conditions for scurvy in troops, and the Army and the Sanitary Commission issued lemons and vegetables to soldiers who showed signs of having developed the disease, though there was not consensus about what was the exact missing factor that caused scurvy, and whether dried vegetables or supplemental foods like molasses might work as well as fresh vegetables. Hammond wrote after the war that potash or iron would help restore bodies afflicted with scurvy.[221] The Sanitary Commission's 1862 report on the disease cautioned commanders to monitor their troops' physical and moral condition alongside their diet, blaming scurvy on irregularities of bodily maintenance, such as mental debilities, or too much or too little exercise.[222]

It was a commonplace among physicians and officers that dried meat and hardtack were inferior to fresh meat and bread, as men could not survive on preserved rations for very long

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[219] Adams, *Doctors in Blue*, 212.

[220] J. Franklin Dyer, *The Journal of a Civil War Surgeon*, ed. Michael B. Chesson (Lincoln and London: University of Nebraska Press, 2003), 52.

[221] Kenneth J. Carpenter, *The History of Scurvy and Vitamin C* (New York: Cambridge University Press, 1986), 128–29, 121–23.

[222] United States Sanitary Commission, *Report of a Committee of the Associate Medical Members of the Sanitary Commission on the Subject of Scurvy, with Special Reference to Practice in the Army and Navy* (Washington, D.C.: Government Printing Office, 1862).

without supplements of vegetables and fresh beef. Patent foods which promised to supply the nutriment that hard bread and dried meat lacked, while still remaining lighter and more portable than sacks of potatoes and beef on the hoof, would seem to be a shortcut around this problem. However, the options for portable foods were few. In the early 1860s, canned foods were available, but they were expensive luxuries enjoyed by officers, not a staple for enlisted men. Justus von Liebig's meat extract—a reduction of whole beef, usually consumed by stirring it into hot water to make beef tea—was also available, but in the Union Army it was thought to be useful only as a stimulant for invalids, not as a food for healthy men.[223] Desiccated vegetables were in more common use as they were thought of as a means to bring salutary variety to the diet. They were heartily disliked by soldiers, who called them "desecrated vegetables" due to the fact that they turned weedy and unpleasant when rehydrated and eaten in soup.[224]

Portable foods had been first used by European armies during the Crimean War. Fought in the mid-1850s by France, Britain, and the Ottoman Empire against Russian incursions into Ottoman territory, the war was a test of the Great Powers' capacities for supplying their armies stationed around the Black Sea from their home ports in continental Europe. This was a modern war fought by the most advanced armies in the world, and Americans were keen to find out which of their innovations could be adopted by their own military. In 1854, a delegation of three US Army officers, led by Major Richard Delafield, was sent to Europe and the front lines of the war to observe the new tactics and technologies of warfare with an eye toward modernizing the American army.[225] His

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[223] William H. Brock, *Justus von Liebig: The Chemical Gatekeeper* (Cambridge: Cambridge University Press, 1997), 226; Hammond, Treatise on Hygiene, 514.

[224] William C. Davis, *A Taste for War: The Culinary History of the Blue and the Gray*, 1st ed. (Mechanicsburg, Pa: Stackpole Books, 2003), 22–23.

[225] Matthew Moten, *The Delafield Commission and the American Military Profession*, 1st ed. (College Station: Texas A & M University Press, 2000).

commission was impressed by the new space- and weight-saving foods being consumed by the ton by the French and British armies. Among the innovations they observed were dried, compressed vegetables; meat extract; granulated gluten; condensed milk; and *viande in poudre,* made of meat and finely ground gelatin. During the visit, Delafield visited the Cholet factory in Paris to observe how compressed vegetables were made for the French army. Potatoes, turnips, carrots, and cabbages were cut into thin slices, partially dried, and then pressed into cakes about one-inch thick by powerful hydraulic presses. Delafield reported that eighty-three rations of spring vegetables weighed only 2¾ pounds; forty thousand of these rations packaged in tin canisters for transport would weigh 4,000 pounds yet occupied a space of only one meter cubed.[226] One tablet of these vegetables could feed a company, as it would swell up to sixteen times its bulk when rehydrated.[227] "Without doubt," Delafield enthused, "the most important particular as regards subsistence of troops in the field is the recent introduction of desiccated food," and he recommended the adoption of these foods by the American military in order to reduce the weight of the supply train.[228]

Even so, in his 1861 report Delafield cautioned against the wholesale adoption of European military dietaries. European soldiers mostly ate bread and potatoes, and a much scantier quantity of food than American troops.[229] Drawing on a longstanding consensus among observers of American habits, Delafield argued that his countrymen needed more food than Europeans, and that food should be primarily meat. Vegetable foods should only be added in enough quantities to prevent

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[226] Richard Delafield, *Report on the Art of War in Europe in 1854, 1855, and 1856*, 36th Cong., 2d Sess. House of Representatives. Ex. Doc. (Washington: G. W. Bowman, printer, 1861) 91.

[227] James M. Sanderson, "Camp Fires and Camp Cooking: Or, Culinary Hints for the Soldier, Including Receipt for Making Bread in the "Portable Field Oven" Furnished by the Subsistence Department. Published for Distribution to the Troops, Headquarters, Army of the Potomac" (US Government Printing Office, 1862) 5.

[228] Richard Delafield, *Report on the Art of War in Europe*, 90.

[229] Ibid. 89.

disease. A further reason for Delafield's caution about adopting new foods was the fact that British and French soldiers suffered horribly from scurvy and other nutritional diseases while stationed on the Crimean peninsula.[230] Short rations were the cause: British soldiers received only 1 pound of meat and 1 pound of bread, and no vegetables. Military brass had assumed that soldiers could supplement by buying what they needed from a nearby town or farm as they would if they were fighting in Europe, but soldiers in the Crimea had no opportunity to buy extra provisions.[231] The other major powers were in a similar bind: French soldiers ate just under 2 pounds of bread per day and 10 ounces of fresh beef or 8 ounces of salt pork. Russians received 1 pound of black bread and 1 pound of meat, with supplemental sauerkraut, barley, and kvass, a low-alcohol beer made from rye bread.[232] American observers noted that these rations seemed far too little to suit the needs of the American soldier, particularly the comparatively small meat ration. Whole meat was thought necessary for Union troops. Meat substitutes, like portable soups, meat extract, and other preparations purported to provide the nutrients of meat in a dried or liquid form could not stand in for actual pork and beef. There was also an element of pride in the Union Army's capacity for providing all the meat the troops could eat. "Since the commencement of the present rebellion, the armies of the United States have been fed as no armies have ever been fed before in time of war," Surgeon General Hammond wrote in 1863, with palpable satisfaction.[233] True innovation in troop provisioning could not come from following European methods or by reducing the amount of food

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[230] Kenneth J. Carpenter, *The History of Scurvy and Vitamin C* (New York: Cambridge University Press, 1986), 113–116; Sanford B. Hunt, "Army Alimentation and Disease," in Austin Flint, ed., *Contributions Relating to the Causation and Prevention of Disease, and to Camp Diseases* (New York: Published for the US Sanitary Commission, by Hurd and Houghton, 1867), 65; *Report of the Commission of Inquiry into the Supplies of the British Army in the Crimea*, *with Evidence annexed. Presented to Both Houses of Parliament by Command of Her Majesty* (London, 1855), 45.

[231] Ibid., 45–46.

[232] Hammond, *A Treatise on Hygiene*, 562–563.

[233] Ibid., 564.

that was provided. A portable ration for the army would have to be made with American products, to meet American needs.

One attempt to do so occurred in 1850 when the inventor and condensed milk entrepreneur Gail Borden attempted to sell to the army a "meat biscuit" made of concentrated extract of meat mixed with superfine flour and baked into a hard cracker. Borden boasted that the biscuit preserved "the quality and flavor of meat fresh from the slaughter," and could withstand the rigors of sea voyages or long land travel. It could be eaten plain, or ground to a powder and made into soup or added to other dishes. Borden's marketing materials quoted testimonials from satisfied army men, including one from a Col. E.V. Sumner: "I have long thought that the compression of wholesome food into a smaller compass, was one of the most important things that remained to be discovered in this age of inventions," Sumner wrote. "Think of a regiment of 500 men cutting loose from all magazines for two months, with no other baggage train than 50 or 60 pack mules."[234] Sumner recommended that the biscuit be tried by the army, and the Commissary Department appointed a board of officers to examine it. Unfortunately for Borden's commercial hopes, the board found that it was not suitable for use. Not only was Borden's recommended 6 ounces of biscuit deemed insufficient daily food for a man, its taste was found to be so foul as to render it inedible.[235] While the field of condensed foods was littered with such disappointments and failures, hopes were still high that a solution would be found. By the early 1860s, army provisioning remained open for a clever entrepreneur who could create a portable meal that retained all of the nutrition of whole meat and fresh bread.

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[234] Gail Borden, *The Meat Biscuit; Invented, Patented, and Manufactured by Gail Borden,* (New-York, Printed by D. Fanshaw, 1851); "New Article of Food—Meat Biscuit," Scientific American 5, no. 27 (March 23, 1850): 213.

[235] Joe Bertram Frantz, *Gail Borden, Dairyman to a Nation*, 1st ed. (Norman: University of Oklahoma Press, 1951), 205–6, 211.

Uniting Science and Art in Albany and Giessen

An American farmer in the 1830s who opened his copy of *The Cultivator* would be met with the agricultural journal's motto, "To Improve the Soil and the Mind."[236] The periodical acted as a clearinghouse for new ideas in agricultural chemistry, with the understanding that intelligence, education, and enterprise were needed to raise better crops. Farmers wrote to the journal's Albany office about their attempts to improve their land and their yields, and the editors made sure to summarize developments in agricultural chemistry that would help them replenish tired soil or fatten livestock. New York state was a hot spot for the scientific agriculture, being developed by farmers and amateur chemists—like John Stanton Gould, who contributed occasional articles for the journal—who paved the way for the adoption of organic chemistry in the United States.[237] One of the journal's roles was to familiarize readers with the work of Justus von Liebig, the English chemist Humphrey Davy, and other European chemists.[238] The Americans were not overawed by the achievements of the Europeans. As one *Cultivator* editorialist put it in 1838, "It is by knowledge thus applied in Europe that agriculture has made such advances there, and with the enterprize [*sic*] and perseverance of our people may we not hope to overtake our fatherland, and even rival it in improvement?"[239]

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[236] Frontispiece, *The Cultivator* Vol. 5 1838-9. Wisconsin Historical Society Archives, Madison, Wisconsin.

[237] Benjamin R. Cohen, *Notes from the Ground: Science, Soil, and Society in the American Countryside*, Yale Agrarian Studies Series (New Haven: Yale University Press, 2009).

[238] Emily Pawley, "Accounting with the Fields: Chemistry and Value in Nutriment in American Agricultural Improvement, 1835–1860," *Science as Culture* 19, no. 4 (2010) 461–82.

[239] Egbert Cowles, "The Improvement of the Mind Leads to the Improvement of the Soil," *The Cultivator*, 1838 vol 5 no 5, 93.

This ethos of scientific advancement could exert a strong influence on the men who read it. This was certainly the case for the young Eben Norton Horsford, who was steeped in a belief in scientific progress and exemplified its ambitions. Horsford was born in 1818 in Moscow, a farming town in the Genesee Valley of western New York State.[240] His father, Jerediah Horsford, was an agricultural improver in his region, and was also involved in politics, serving in both the New York State legislature in the 1830s and in the US House of Representatives from 1851 to 53. His son was educated in local schools and by his mother, Charity Maria Norton, who maintained a circulating library for the town in the family home.[241] Horsford began work at the age of sixteen, teaching school in a nearby town and surveying for the railroad. He might have remained a rural schoolteacher if he hadn't met men who were active in the scientific life of New York and who encouraged him to undertake further study. In 1837, Horsford became an assistant to the geologist James Hall, who had come to the Genesee Valley to survey it for the New York State Natural History Survey. Hall recommended that Horsford enroll in the Rensselaer School in Troy, New York, a new institution dedicated to practical scientific training. At Rensselaer, Horsford studied natural science and engineering under Amos Eaton, and received laboratory instruction in chemistry.[242] He received a bachelor's degree in 1838 and went to work teaching natural history at the Albany Female Academy, with an eye toward becoming the school's headmaster.[243]

Horsford had a roving intelligence, an optimistic nature, and a speculative turn of mind, all of which caused him to move from one project to another throughout his professional life. While

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[240] Moscow, NY, would later change its name to Leicester during the Cold War.

[241] Charles L. Jackson, *Eben Norton Horsford* (Proceedings of the American Academy of Arts and Sciences, 1892).

[242] The chemist and educator Amos Eaton was the father of Amos Beebe Eaton, the Commissary General.

[243] Margaret W. Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans*, 1840-1880, Yale Studies in the History of Science and Medicine 9 (New Haven: Yale University Press, 1975), 50–52. Rossiter has written the definitive study of Horsford's early years and time as a Harvard professor. My narrative follows her account.

teaching school in Albany in the early 1840s, he tried his hand at a number of schemes: he preached, went to temperance meetings, and tried to get a daguerreotype business started in order to pull himself out of debt. This latter business failed. As he wrote his sister Eliza Horsford Tryon in 1841, he had been, as always, too sanguine about his prospects and too extravagant in his expenditures.[244] Horsford had one further risky venture while in Albany: he fell in love with one of his students. He and the student, Mary L'Hommedieu Gardiner, wanted to marry, but the match was blocked by Gardiner's father. Samuel Gardiner, a wealthy landowner, was singularly unimpressed by his daughter's schoolteacher suitor, and Horsford aimed to win Gardiner over by becoming a professor. He decided to study chemistry under Justus von Liebig in Giessen, Germany. Liebig was then at the height of his fame in the United States. Horsford was able to leverage his connections to obtain a letter of introduction to Liebig as well as the loans he needed to make the journey, and he set sail for Europe in 1844.[245] Horsford found Giessen to be a paradise for a young chemistry student, and in Liebig he had a mentor whom he idolized. Horsford worked hard at his studies and earned the favor of his teachers. He wrote about his studies in *The Cultivator*, sending letters to the journal about his visits to agricultural experiment stations and life in Liebig's lab.[246]

Horsford began to think of returning home when he found out that Harvard University was hiring a new Rumford Professor of the Application of Science to the Useful Arts, to be employed at the newly created Lawrence Scientific School. Horsford lobbied for the job from abroad, then sailed home in late 1846 without having earned his Ph.D., and also without knowing if he had won the position. In a lucky break, he was elected the new Rumford professor early the next year. The new

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[244] Eben Norton Horsford to Eliza Horsford Tryon, November 16, 1841. Horsford Tryon Family Papers, 1800-2000, Library of Congress.

[245] Rossiter, *The Emergence of Agricultural Science*, 53–55.

[246] See, e.g. E.N. Horsford, "Letter from Mr. Horsford—No. 1," The Cultivator vol. 2, no. 2 (February 1845): 54.

professor wed Mary Gardiner, and they set up housekeeping in Cambridge. Harvard promised Horsford a well-appointed chemical laboratory, and so he drew up plans for a large new building with central heating and ventilation, ample laboratory workspace for thirty students, a private lab for himself, and a residence, all built on the model of the facilities at Giessen. According to historian of science Margaret Rossiter, the cost of the building—plus imported textbooks and chemicals to fill it—staggered the Harvard Corporation, but Horsford ended up with the best laboratory in the United States. However, he had to work very hard for his modest salary. He never had enough students to amply cover his costs, and the students he did have were interested only in learning elementary analysis for use in medicine or industry, rather than the advanced techniques he hoped to teach.[247] Thus Horsford fell into the same trap facing other American agricultural chemists in the mid-nineteenth century who had obtained advanced training abroad: once back home they did not always enjoy the status of their European counterparts, and struggled to find employment where they could use their skills. Most American professorships entailed heavy teaching burdens and little time for research. The chemists also had to contend with both the skepticism and the unreasonable hopes of the broader public about their discipline. While scientific boosters like *The Cultivator* kept farmers' hopes for improvement through science at a high pitch, many Americans were unconvinced of the utility of pure chemical research for its own sake, so Horsford's pool of potential students remained small.[248]

By the mid-1850s, Horsford's interest had drifted away from research and teaching toward industry. His wife Mary had passed away in childbirth in 1855, and Horsford married her sister,

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[247] Rossiter, *The Emergence of Agricultural Science*, 73–84.

[248] Charles E. Rosenberg, "Science and Social Values in Nineteenth-Century America: A Case Study in the Growth of Scientific Institutions," in *No Other Gods: On Science and American Social Thought* (Baltimore: The Johns Hopkins University Press, 1997), 135–152.

Phoebe Dayton Gardiner, in 1857. His major project during this period was a chemical leavening for bread. This work was likely indebted to Liebig's 1854 suggestion that lime water could be used instead of plain water to make a light and airy bread. Horsford's design improved on this idea by producing leavening agents in a powdered form. In 1856, Horsford notified his mentor of his work on the question, and sent him a sample of it to try in his own household. A few years later, Horsford had the final formula: phosphate of lime (calcium acid phosphate) mixed with bicarbonate of soda, which would create puffy bread when mixed with flour and water and baked. In 1859, Horsford started the Rumford Chemical Works to manufacture it.[249] He resigned his professorship in 1863, leaving experimental chemistry behind in order to become a full-time businessman and inventor.

Calculating the Dietary Needs of the Individual Man

Even though Horsford had left academia in the early 1860s, he worked to retain his identity as a scientist and an expert on the chemistry of food. This was necessary for his business, as he claimed that the use of his baking powder would reduce bread and pastry making to "scientific precision."[250] The sales pitch rested on Horsford's status as a prominent Liebig disciple, as well as on his mentor's theory of metabolism. In particular, Horsford relied on two aspects of Liebig's work. One was the notion that the fundamental chemical components of food were integrated in an unchanged form into the composition of the body, and that these fundamental elements were burned or used up as the body worked and respired. This centered his attention on phosphate

[249] Paul R Jones, "Justus von Liebig, Eben Horsford and the Development of the Baking Powder Industry," *Ambix* 40, no. 2 (1993): 65–74. The Clabber Girl Corporation now owns the Rumford brand, which is still sold in grocery stores.

[250] Eben Norton Horsford, *The Theory and Art of Bread-Making. A New Process without the Use of Ferment* (Cambridge, Welch, Bigelow, and Company, Printers, 1861), 21.

compounds as an essential nutrient, as it was both omnipresent in food and in the body. The second was the notion that nitrogen was the essential food for producing work, so that the most nutritious foods were ones like meat that had a similar chemical makeup to the body tissues.[251]

At the same time, while Horsford was designing his ration, evidence was amassing against his mentor's model of metabolism. In 1866, chemists Adolf Fick and Johannes Wislicenus climbed a mountain to test the idea that the body burned nitrogen in proportion to the work it performed. They found that in their morning of mountaineering they had performed more work than could have been derived from the nitrogenous foods they had eaten, and they concluded that non-nitrogenous foods, like sugar and fat, also provided fuel for work. At roughly the same time, the British chemist Edward Frankland had measured the energy value of foods using a bomb calorimeter, showing that nutrients other than nitrogen could be used as fuel by the body.[252] These experiments spelled the end of Liebig's model of metabolism, but in 1864, when Horsford was designing his ration, nitrogen still remained the central fuel for work and would for a few years longer. The importance of nitrogen for diet was further cemented in Horsford's mind by the fact that his own work as a student at Giessen, analyzing the nitrogen content of grains and vegetables, was an extension of Liebig's model.[253]

While the notion that the fundamental chemical components of food were assimilated directly into the body led to some conclusions about the nature of metabolism that were later discarded, it nevertheless created space for new ways to conceptualize the relationship between diet

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[251] John Call Dalton, *A Treatise on Human Physiology* (Philadelphia: Blanchard and Lea, 1861), 88.

[252] Kenneth J. Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition* (Cambridge: Cambridge University Press, 1994), 65–67.

[253] Eben Norton Horsford, *Analyses of Grains and Vegetables: Distinguishing the Nitrogenous from the Non-Nitrogenous Ingredients, for the Purpose of Estimating Their Separate Values for Nutrition: Also, on Ammonia Found in Glaciers: And on the Action and Ingredients of Manures* (Boston : J. Munroe, 1846); Rossiter, The Emergence of Agricultural Science, 64.

and health. The fact that the food contained certain substances that were also present in living bodies meant that these substances must nourish the body, and scientists struggled to assign significance to them. Phosphate compounds were one such substance. Contemporary chemical analysis of living tissues had found that phosphates made up a major part of the skeleton as well as the brains and nerves, and some scientists assumed that its presence in the body meant that it ought to be an important part of the diet.[254] A nascent sense of the nutritional value of trace minerals in food—an idea that was to dominate nutrition research in the twentieth century—was present in these theories that the phosphates were important elements of diet. Medical authorities hypothesized that a lack of phosphates was a cause of the dietary deficiency disease rickets, as children exhibiting the characteristic signs of the disease excreted much of their bodies' phosphates, and their bones were correspondingly soft and pliable.[255] It was also possible that phosphates were expended when the body underwent extreme mental exertion. Some physiologists argued that this was so, observing that phosphates were to be found in great quantities in the urine of clergymen on Sundays, when they were exhausted after giving their sermons.[256] Others went further, arguing that phosphates were so fundamental to the body's makeup that no bodily functions could take place without it. The chemist Jacob Moleschott's notorious quip "without phosphorus, no thought" primarily served as a provocative illustration of the idea that physical and mental strength were functions of matter, but it also reflected his belief that the basic chemical constituents of food were

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[254] Bernard Agranoff, "Brain Food," *Gastronomica* 8, no. 3 (August 1, 2008) 79–85.

[255] Gunning S. Bedford, *Clinical Lectures on the Diseases of Women and Children* (New York: William Wood & Co. 1864), 476.

[256] William Benjamin Carpenter, *Principles of Human Physiology : With Their Chief Applications to Psychology, Pathology, Therapeutics, Hygiene, and Forensic Medicine* (London : John Churchill, 1853) 351; John William Draper, *Human Physiology, Statical and Dynamical, Or, The Conditions and Course of the Life of Man*, 7th ed. (New York: Harper & Brothers, 1865), 272.

necessary for the proper functioning of the body.[257] On a purely medical level, it was thought that "mineral matters" like phosphates were essential for maintaining health in general, and so one should eat brown bread, meat broth, and other foods rich in minerals. A diet of only refined foods would debilitate the body and leave it vulnerable to life-threatening fevers and colds.[258] This understanding of the role of nutrients in the body was essential background to Horsford's pitch for his yeast powder and his army ration: his food was fortified with phosphates, which refined foods, like standard white-flour American bread, lacked. As Horsford's leavening powder was made from phosphate of lime, he argued that it could replace the lost phosphates, making white bread as nutritious as whole wheat.

The idea that nitrogen was the body's essential fuel was crucial to Horsford's ration pitch. It also reflected the nascent integration of physiology with physics, as scientists took up the question of how much of this fuel was needed to support a certain amount of labor.[259] The British chemist and fellow Liebig student Lyon Playfair took up this question, arguing that the law of the conservation of energy applied to the energy and work of human bodies. In a lecture at London's Royal Institution in April 1865 entitled "On the Food of Man in Relation to his Useful Work," Playfair calculated the amount and type of food needed by a man at work and at rest by examining

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[257] Jacob Moleschott, *De l'Alimentation et du Régime,* trans. Ferdinand Flocon, 3rd ed. (Paris: Librairie Victor Masson, 1858), 113. W.O. Atwater, "How Food Nourishes the Body," *The Century Magazine*, June 1887; Harmke Kamminga, "Nutrition for the People, or the Fate of Jacob Moleschott's Contest for a Humanist Science," Clio Medica (Amsterdam, Netherlands) 32 (1995): 15–47; Frederick Gregory, *Scientific Materialism in Nineteenth Century Germany* (Dordrecht-Holland & Boston, USA.: D. Reidel Publishing Company, 1977).

[258] Edwin Lankester, *On Food: Being Lectures Delivered at the South Kensington Museum* (Hardwicke, 1861), 35. Friedrich William Beneké, "On the Physiology and Pathology of the Phosphate and Oxalate of Lime, and Their Relation to the Formation of Cells," *The Lancet* 1 (April 19, 1851): 431–34. Jonathan Pereira, *A Treatise on Food and Diet* (New York: J. & H.G. Langley, 1843), 29.

[259] Hermann von Helmholtz, "On the Interaction of Natural Forces," trans. John Tyndall, *The American Journal of Science and Arts* 24, no. 71 (1857): 189–216; Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition*; Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (University of California Press, 1992); Stephen Patrick Rice, *Minding the Machine Languages of Class in Early Industrial America* (Berkeley, Calif.: University of California Press, 2004).

military dietaries. He considered hard work to be equivalent to about fifteen miles of marching per day while carrying 60 pounds of equipment, which was the average of the labor performed by the English, Prussian, and Union armies. By averaging their dietaries, Playfair concluded that about 5.5 ounces of nitrogen (contained in a larger weight of meat) and 23.5 ounces of starchy material (from bread) were required to withstand the fatigue of war.[260] As he did no physiological testing of the diets, Playfair assumed that the food given to soldiers was an accurate reflection of what they needed to perform a day's work, and further assumed that the soldiers received the food that was allotted to them. Yet Playfair's notion that the nitrogen contained in a larger quantity of whole meat or bread contained the essence of the food's nutrition was quite useful for Horsford.[261] In particular, the idea that nitrogen was the most important fuel for the Union soldier was a fundamental assumption for Horsford, one that provided the theoretical basis for his condensed army ration.[262]

Selling the Marching Ration

While Horsford was trying to get the Rumford Baking Powder company off the ground in the early 1860s, he was simultaneously trying to build a reputation as an inventor in Washington. He gave public lectures at the Smithsonian Institution, drew up a design for a safe, and sketched further plans for a submarine to patrol Boston's harbor. But his main campaign prior to the ration project was to try to convince the Army Medical Department to recommend his leavening powder for

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[260] Lyon Playfair, *On the Food of Man in Relation to His Useful Work* (Edinburgh: Edmonston and Douglas, 1865), 15.

[261] Untitled notes for marching ration, Horsford Family Papers II, Professional Papers A-F MC 05 32 Folder 9; Rensselaer Polytechnic Institute Archives, Troy, N.Y. Hereafter RPI.

[262] Sir William Robert Grove et al., *The Correlation and Conservation of Forces: A Series of Expositions* (New York: D. Appleton and Company, 1865), XXXV; cited in Horsford, Reply to the Report of the Majority of the Board of Officers. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

making the army's bread.[263] While Surgeon General Hammond had praised Horsford's chemical leavening for bread in his 1863 treatise on army hygiene, it took more than one supporter to get his proposals accepted.[264] Horsford made the rounds in Washington, paying near-daily visits to the Navy Department, the Patent Office, the Sanitary Commission, the Capitol, the White House, and parties and dinners at private clubs and homes. His status as an ex-Harvard professor and the son of a former congressman provided a social entrée; in addition, his wife's family was wealthy and well connected.[265] So when the Congressional Committee on the Conduct of the War began looking for an inventor to improve the army ration in March 1864, Horsford was well placed to offer his proposal.

A month later, Horsford circulated a privately printed pamphlet among his contacts in Washington. It detailed his plan for improving the army ration, putting it on a scientific footing and reducing its weight and cost. In order to educate his audience and establish his authority, he began the pamphlet with a discourse on scientific nutrition. He divided foodstuffs into two types: organic and inorganic. Derived from animal and plant sources, organic foods comprised muscle-building foods like meat and saccharine foods like bread, which were burned by the body to create heat. Inorganic foods were the "mineral matters," like the phosphates and salts, which seemed to be important for tissue formation and other functions.[266] Men who worked very hard also needed condiments that could act as stimulants: coffee, tea, cocoa, wine and spirits, salt, pepper, and vinegar. Horsford considered the army's ration to be a complete one by these lights: the meat and bread

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[263] Eben Norton Horsford to Phoebe Gardiner Horsford, January 13, 15, 19, 23, 1863. Horsford Family Papers, Phoebe Horsford, RPI.

[264] Hammond, *A Treatise on Hygiene*, 521.

[265] Rossiter, *The Emergence of Agricultural Science*, 50–1, 55.

[266] Eben Norton Horsford, *The Army Ration: How to Diminish Its Weight and Bulk, Secure Economy in Its Administration, Avoid Waste, and Increase the Comfort, Efficiency, and Mobility of Troops* (D. Van Nostrand, 1864) 4.

contained organic and inorganic food; salt, coffee, and vinegar acted as stimulants; and sugar augmented the saccharine component of the ration. Salt pork provided essential fat in the diet and provided a sense of satiety.[267] On the whole, "The present ration has been shaped by a thousand exigencies, necessities, and suggestions; it is, in the main, a long-tried ration, entitled to the respect due to a system thoroughly organized and worked out, and for these reasons it should not be lightly trifled with," Horsford wrote.[268] In proposing to trifle with it, his goal was to make the ration more portable and durable, and reduce it in weight to between 13 and 16 ounces and in bulk to 32 inches. He suggested that the bread ration could be improved by issuing to the troops self-rising flour of his own design, which could be cooked in a canteen case over a campfire. For times when soldiers could not build a fire, such as picket duty, cavalry expeditions, or on the march, wheat that had been roasted and ground could replace the bread. Roasting the wheat was essential as the process removed some of the water, converted starch into dextrine, and made it taste sweeter.[269]

Improving the meat ration was a trickier problem due to the difficulties involved in preserving and transporting fresh meat for consumption on the march. The army needed a light marching ration consisting of beef that had been cooked and seasoned, was palatable, and capable of infinite preservation. Horsford thought that sausage was the answer. As he wrote, it could be made "from every part of the animal, including the liver and even the blood. The cleaned intestine is a costless but perfect can. Smoke, heat, dry air, salt, and fragrant herbs and spices are [its] antiseptics."[270] Horsford argued that he could reduce a daily allowance of 10 ounces of beef to a 3-ounce puck of meat. He claimed that his process would remove all of the water from the beef,

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[267] Ibid., 6.

[268] Ibid., 11–12.

[269] Ibid., 12–18.

[270] Ibid., 24.

leaving its nutritive qualities.[271] His ration design bears a strong resemblance to his mentor Liebig's claim that the meat extract contained all of the nutrients of fresh beef in fluid form; the essential difference was only that Horsford's condensed meat was chewable rather than drinkable. Both Liebig's meat extract and Horsford's meat ration rested on the notion that the nutritive qualities of meat were unchanged when the meat was boiled into extract or pressed and dried into a puck. Also like his mentor, Horsford proposed to produce his new food on an industrial scale, by building a factory that could "sausage-ize" whole cattle. The process involved mincing the meat and organs of cattle, then cooking the minced meat and drying it in evaporating pans. Boilers could break down the soft bones, gristle, and tendon into gelatin, which could be incorporated into the meat. The mixture would be condensed with a hydraulic press into cakes of one foot square that had been scored like a chocolate bar. To finish, the surface of the meat would be varnished with gelatin and a light coating of antiseptic sulfate of lime, to protect the meat from atmospheric influences that would cause it to spoil. A soldier would break off a square of the meat on the scored marks and gnaw on it plain or cook it in a pan.

The chief selling point for the army was that Horsford's proposal would reduce the weight of the marching ration by one-third. On a march, a soldier could carry with him 8 ounces of roasted wheat or 11 ounces of self-rising flour plus a 3-ounce daily ration of condensed meat. By contrast, the marching ration in use by the army at that time weighed between 2 and 2½ pounds. Horsford's marching ration would also take up less space in supply wagons: an eight-day supply of hardtack occupied a space of 500 cubic inches, while an eight-day supply of Horsford's self-rising flour would take up 188 cubic inches, and the condensed beef 32 cubic inches. "With the aid of mules carrying self-rising flour or roasted wheat and condensed beef in bulk, it is not difficult to see that an army

[271] Ibid., 25.

of one hundred thousand men might swing around from one base of supplies to another, with an interval of thirty or even forty days between," Horsford wrote.[272]

Horsford's ration plan was enthusiastically accepted by officers and civilian leaders, who were delighted by the prospect of delivering the right amount of nutrition to the troops at the minimum weight. His work was pushed forward by Edwin Stanton, the Secretary of War; Henry Halleck, the Chief of Staff; and Montgomery Meigs, the Quartermaster General, among others, and they assured Horsford that they would get his ration accepted by the army without delay. For these men, the technical details were largely irrelevant.[273] Buoyed by the support, Horsford spent much of the spring of 1864 in his laboratory at the Smithsonian Institution, producing samples of the meat ration and becoming increasingly pleased with his design. As he wrote to his wife Phoebe, the meat cakes were "about half or three-fourths an inch thick and nearly three inches in diameter, varnished with nice English gelatin which makes the beautifully smooth surface of the meat shine so beautifully."[274] As the spring progressed, Horsford invited a string of visitors to his laboratory, to taste samples of the meat cakes, roasted wheat, and bread made from self-rising flour. It seemed to Horsford that his guests left impressed by the food and convinced by the arguments in his pamphlet.[275]

Horsford's diligent lobbying paid off, the army bureaucracy moved toward evaluating his ration design, appointing a board of officers to determine whether it ought to be adopted. This board was composed of representatives of the Quartermaster Department, the Commissary General of Subsistence, and two army medical inspectors. One of the inspectors was Horsford's

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[272] Ibid., 27.

[273] Horsford to Phoebe Gardiner Horsford, April 21, 1864, April 26, 1864. RPI.

[274] Horsford to Phoebe Gardiner Horsford, undated, [probably late 1863, early 1864] RPI.

[275] Horsford to Phoebe Gardiner Horsford, June 3, 1864 RPI.

friend and close collaborator, Augustus Choate Hamlin.[276] Acting Surgeon General Joseph Barnes, who had succeeded Hammond in the post, had recommended Hamlin as one of the representatives from the medical department, with a note commending the merit of Horsford's proposal.[277] Horsford had reason to believe that the board would recommend his ration with little delay, as he had received assurances to that effect from General Halleck and Quartermaster General Meigs.[278]

The board began their work by studying Horsford's pamphlet, and met with Horsford at the Smithsonian in late June. Horsford had readied his lab with samples of the wheat and meat rations, and bread made from self-rising flour, adding butter, currant jelly, iced water, and cigars for refreshment. He set up a display of the hydraulic press, scales, and gas flames used to prepare and press the meat ration. During the visit, Horsford baked some loaves of bread and prepared different dishes with the meat. "I had it dry to be eaten plain. I warmed it up which gave them steak—I added water and made a nice stew. I mixed the stew with soft bread crumbs, and then I mixed a batch with roasted wheat—in all it was delightful," Horsford wrote to Phoebe. The members of the board were somewhat less impressed by the bread and the meat ration, noting in their August 13 report that the bread made from self-rising flour was light and palatable, but the meat needed to be cooked in butter or beef fat to improve its taste.[279] The following day Horsford demonstrated how to cook the food outdoors, baking the bread in the ashes of a hot campfire. The board noted that cooking the

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[276] Rezneck, "Horsford's 'Marching Ration' for the Civil War Army"; "Miscellaneous.," *Medical and Surgical Reporter* 11, no. 26 (June 25, 1864): 409.

[277] Barnes, undated note. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

[278] Horsford to Phoebe Gardiner Horsford, June 15, 1864 RPI.

[279] Board of Officers Report, August 13, 1864. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

bread over a fire met with less success than in an oven, as the hot fire burned the outside of the loaf and left it raw inside.[280]

Once the board had settled the question of the ration's taste and ease of preparation, they were left with the more important question of whether Horsford's condensed bread and meat would adequately feed the soldiers. The board asked Joseph Janvier Woodward, a physician and curator of the Army Medical Museum, to scientifically evaluate the ration. Woodward was dedicated to advancing basic knowledge about medicine, inculcating a scientific ethos among the army medical corps and cultivating the capacities of army physicians to do research in pathology.[281] Woodward relied on the work of the surgeon and chemist B. F. Craig to provide a chemical analysis of the ration. Craig ran the newly created Chemical Laboratory of the Surgeon General's Office, which had been founded during the war in order to check the quality of the army's medical supplies.[282]

Together, Woodward and Craig worked to dismantle Horsford's claims about the nutritional superiority of his patent foods. The crux of the issue for Woodward was that nutritional chemistry was far too undeveloped to make any confident assertions about human diet. He was particularly skeptical of Horsford's argument about the value of phosphates in human nutrition. He granted that it would be possible to estimate a person's daily needs for phosphates by considering the amount lost daily in "tissue metamorphosis," but it was not clear whether the total amount of phosphates excreted in the urine and feces resulted from the metamorphosis of tissue or from an excess of it in the food. Woodward cited Hammond's 1857 experiments on the nutritive value of albumen, starch, and gum, in which the former surgeon general found that he excreted 13.66 grains

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[280] Ibid.; Horsford to Phoebe Gardiner Horsford, June 29, 1864 Horsford Family Papers, Phoebe Horsford. RPI.

[281] Devine, *Learning from the Wounded*, 76, 85.

[282] Woodward, The Medical Staff of the United States Army, and Its Scientific Work, 15; cited in Devine, *Learning from the Wounded*, 331.

of phosphoric acid daily when eating a phosphorus-free diet of only distilled water and corn starch.[283] This lent credence to the notion that the phosphorus was excreted as part of tissue metamorphosis, but did not prove that supplemental phosphorus was needed in the diet. Woodward assumed that since Hammond was bigger than most men, the daily phosphorus requirement for the average man could not be more than 13.66 grains, an amount that was almost always found in a normal diet of bread and meat. In any case it was not clear how much phosphates were needed daily by the human body. He dismissed Horsford's insistence that his ration supplied a crucial amount of the mineral.

A second target of Woodward's analysis was Horsford's assertion that his condensed ration, containing just a few ounces of food, was nutritionally equivalent to a much larger quantity of bread and meat. Woodward thought there was little justification for the chemist's claim that 8 ounces of his roasted whole wheat was nutritionally equivalent to 15 ounces of white flour. His argument against Horsford was based on Horsford's own sources: the work of French agricultural chemists such as Jean-Augustin Barral and Jean-Baptiste Boussingault, as well as B. F. Craig's analysis of the roasted wheat. Woodward painstakingly listed citations and figures for the chemical makeup of wheat in his report; but despite this careful work, he dismissed these figures' relevance for the army ration. For example, he agreed with Barral's finding that nearly a third of the nutrients of wheat were lost when it was sifted to make white flour, but noted that this would only amount to a substantial decrease in its value as a food if nitrogen were the lone consideration when considering the nutritive value of wheat. Woodward noted that plain white flour contained fat, sugar, and starch as well, all of which nourished the body. From this standpoint, he argued that the nutritive value of

[283] William Alexander Hammond, *Experimental Researches Relative to the Nutritive Value and Physiological Effects of Albumen, Starch, and Gum, When Singly and Exclusively Used as Food* (Philadelphia: T.K. and P.G. Collins, 1857). A grain is a unit of mass equal to 64.8 milligrams.

roasted and ground wheat was "just a trifle more" than the flour made from the same grain: 8 ounces of the former was equivalent to only 8.5 ounces of the latter.[284]

Horsford's singular focus on nitrogen was the result of his over-reliance on European models for provisioning troops, Woodward argued. It is notable that Woodward did not address Horsford's argument that 10 ounces of meat per day was enough to satisfy an individual man, as it is likely that Woodward did not think such a calculation was useful or even possible. Instead, Woodward focused on the local conditions of the American soldier. The relevant factor was Americans' meat eating habits: Union soldiers enjoyed a plentiful amount of beef and pork, which contained an ample supply of nitrogen, so it was unnecessary to even measure the nitrogen content of bread and meat in the Union Army ration. In France, by contrast, soldiers had a very small amount of meat in their rations, and furthermore, the low diet of French civilians altered the priorities of French scientists. The historian E. C. Spary has noted that the French medical chemists assigned a high nutritional value to wheat gluten, reflecting the high cultural status that wheaten bread had in the country.[285] Woodward put it a bit differently: "Few of the poorer classes are able to purchase meat frequently," he wrote, "hence the great importance which the nitrogenous matters of the wheat assume in the ideas of the French chemists."[286]

The board also rejected Horsford's claim that American soldiers should eat desiccated grain because it had been used by soldiers and explorers for centuries. The notion that the diets of foreign peoples could serve as a guide for American diets was a crucial part of Horsford's argument, yet one where he and his physician antagonists talked past one another entirely. No matter how hard

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[284] J.J. Woodward to J.K. Barnes, July 26, 1864. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

[285] E. C. Spary, *Feeding France: New Sciences of Food, 1760-1815* (Cambridge; New York: Cambridge University Press, 2014).

[286] Woodward to Barnes, July 26, 1864. National Archives.

Horsford argued for the wisdom of the Prussian, Austrian, and Russian armies' method of feeding their soldiers on bread made from unbolted rye flour, it fell on deaf ears. Likewise his arguments in favor of the *farina tostado* (toasted flour) of Bolivia and Chile and the *kavurma* (hashed, compressed, cooked beef) eaten by Turkish soldiers were considered to be of no account by the Board.[287] The climate and circumstances in which soldiers labored "may be such as to render hurtful and insufficient, the food used by one people, when supplied to others differently situated in their respects … so different may be the tastes, habits, and duties of the soldiers composing the respective Armies, and the climate under which military service is exacted," the Board argued.[288]

The surgeon and chemist B. F. Craig was more pointed than Woodward or the Board itself in his critique of Horsford's ration. Craig argued in a private letter to the commissary general that the chemistry of food was irrelevant for understanding human nutrition:

> The relative nutritive value of bolted [white] and unbolted [whole wheat] flour has been a good deal discussed within the last twenty years. It would perhaps be a work of supererogation to go over this discussion here, and to show that the only guide to the proper composition of human food is to be found in the instinctive preferences of mankind, and that the general demand for white bread rather than brown expresses a desire of the system for the starch of the fine flour rather than for the gluten and phosphates of the coarse, and that no amount of word spinning about the functions of nitrogenous compounds & the transformations of phosphoric acid in the animal economy can weigh against an observed physiological fact.[289]

By calling habit and tradition an "observed physiological fact," Craig was invoking not the authority of the laboratory, but a particularly American meaning of the word "physiology": a set of observations about the best way to live, rather than an experimental science.[290] The bottom line was

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[287] Horsford, Reply to the Report of the Majority of the Board of Officers. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

[288] Board of Officers Report, August 13, 1864. Folder Horsford, E. N. (Prof) 1864 Marching Ration. National Archives.

[289] B.F. Craig to Amos Eaton, February 4, 1865. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

[290] Toby A. Appel, "Physiology in American Women's Colleges: The Rise and Decline of a Female Subculture," *Isis* 85, no. 1 (March 1, 1994): 26–56, doi:10.2307/235895; Stephen Patrick Rice, *Minding the Machine Languages of Class in Early*

that the American soldier's diet emerged out of habit and common practices, and his health was dependent on the maintenance of these practices, even in wartime. Novel approaches to diet could therefore only be harmful.

Nevertheless, the Army Medical Department did not reject Horsford's ration design as entirely useless. Woodward thought that Horsford's condensed beef was the only reasonable aspect of the ration, and it could serve as an acceptable substitute for salt beef in the soldier's diet. As beef contained about 80 percent water, Horsford's claim that 3 ounces of condensed beef was equivalent to 10 ounces of fresh beef was "probably therefore substantially correct," Woodward wrote. His only criticism of the sausage was that the fat had been trimmed away, thereby losing an important part of the soldier's diet. Of course, it could only be used if it would keep well and if the soldiers were found to like it. "If it is not relished, it will not afford adequate nourishment no matter what be its chemical composition," Woodward wrote.[291]

Yet Horsford's proposal faced a further obstacle to acceptance: that of wounded pride on the part of the Commissary Department officers. To a degree that the professor had not anticipated, his pamphlet on the army ration had put them in a bind. The pamphlet had circulated among the board members' commanding officers, and it would reflect badly on the Subsistence Department if its methods for provisioning troops wasted as much food as Horsford alleged it did. The board's report was to land on the desk of Secretary of War Stanton, so much of it read as an exoneration of the Commissary's existing plan for provisioning troops, written to save face in front of the boss. The scientific questions raised by Woodward therefore took second place in the report to the board's

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Industrial America (Berkeley, Calif.: University of California Press, 2004); Charles Rosenberg, "Catechisms of Health: The Body in the Prebellum Classroom," *Bulletin of the History of Medicine* 69 no. 2 (1995): 175-197; Martha H. Verbrugge, *Able-Bodied Womanhood: Personal Health and Social Change in Nineteenth-Century Boston* (New York: Oxford University Press, 1988).

[291] J.J. Woodward to J.K. Barnes, July 26, 1864. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

interest in correcting what it perceived to be Horsford's gross errors of fact and calculation with regard to the transportation costs and waste of the current army ration. It was not true, the board argued, that troops on the march threw away one third of their rations; nor was it the case that the army threw away the hides, bones, and tallow of its butchered cattle rather than sell it to renderers and tanneries. Most damningly, the board alleged that Horsford was mistaken on many other important points: he did not accurately calculate how much edible meat could be obtained from the cattle driven behind marching troops, nor how much food could be packed in a wagon, nor how many days the army marched in a year. The board went so far as to impugn Horsford's motives for writing his pamphlet in the first place, edging close to insulting the chemist's honor. Horsford's figures were "calculated to arrest the attention of the general reader, and to impress his mind with the erroneous idea that 'the losses which the present system entails, and which it is practicable to avoid, are of the most stupendous magnitude,'" the Board wrote, sarcastically quoting Horsford's pamphlet in its report.[292]

The Board of Officers' unwillingness to admit to waste in the Subsistence Department was all the more striking considering the fact that only a few months earlier in 1864, Commissary General Eaton had reported to the Congressional Committee on the Conduct of the War that the loss of subsistence stores during a march accorded with Horsford's estimates.[293] In contradiction to Eaton's letter, the board wrote in their report that these losses were fairly small. They obtained confirmation of this point by pursuing one of Horsford's informants to get him to take back what he had told the chemist. H. F. Clark, the chief commissary of the Army of the Potomac, had informed Horsford that the losses of the ration while marching amounted to one-third of the total

[292] Board of Officers Report, August 13, 1864. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

[293] Amos B. Eaton to B.F. Wade, March 12, 1864. Folder Horsford EN (Prof) (1864-65) Marching Ration. National Archives.

food supplied. When queried by the board during their investigation, Clark quickly recanted. He wrote to the board in June 1864 that any comment he might have made to Horsford was based on no calculations, and was so casual that it had escaped his memory. Regardless of what he might have said to Horsford, under no circumstances did he mean to convey that the losses were that high. Instead, Clark told them, the estimated loss of foodstuffs on the march was about ten percent.[294]

On the grounds of Woodward's negative scientific report and the real (or invented) errors in Horsford's calculations about subsistence losses, the board recommended against trying the ration. They concluded that its nutritive value was about half that of the present marching ration, and 3 ounces of condensed beef and 10 ounces of roasted wheat was too little to sustain a soldier at full strength for any length of time. Horsford's friend on the board, Augustus Choate Hamlin, objected to this conclusion, and only signed his name to a second assessment that recommended a small field trial of the ration "in order that all doubts upon the subject may be satisfactorily removed."[295] Hamlin did not think that the board's evidence was complete enough to sustain its detailed critique of Horsford's ration, and he believed their focus on his errors in calculation meant that they had overlooked the question of whether the proposed ration would also be nutritious. Answering this question required recourse to the facts as Horsford had presented them, Hamlin argued. The proper scientific context for assessing these facts, he argued, was the dietaries of the armies of different countries, and the experiments of scientists about how much carbon and nitrogen the system needed.[296] Finally, Hamlin argued that armies already marched on small quantities of meat and grain, pointedly noting that "the Rebels [are] marching with rapidity and without much loss in straggling

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[294] H. F. Clark to the Office of the Commissary General, June 27, 1864. Folder Horsford, E. N. (1865 Washington D.C.) (Prof) National Archives.

[295] Board of Officers Report, August 13, 1864. Folder Horsford, E. N. (Prof) 1864 Marching Ration. National Archives.

[296] A. C. Hamlin to Charles Thomas, August 11, 1864. Folder Horsford, E. N. (Prof) 1864 Marching Ration. National Archives.

on the strength afforded by a daily ration of 4 to 8 ounces of bacon and 8 to 16 ounces of flour only."[297]

The board's rejection of his ration infuriated Horsford. He wrote an impassioned, lengthy protest to Secretary of War Stanton in response. When this did not produce the desired effect, he tried more direct lobbying. On February 15, 1865, he set off for the front in Virginia to hand-deliver a sample of the ration to General Ulysses S. Grant at his headquarters at City Point. Upon arrival, he and the general had a brief meeting, and Horsford obtained a letter recommending to Stanton that 500,000 of Horsford's rations be procured as a trial.[298] By his own account, Horsford simply showed Grant the part of his pamphlet where he argued that his ration would save many bushels of wheat, and this put Grant in favor of giving it a try.[299] When Horsford returned to Washington, General Halleck brought Grant's letter to Stanton. He returned to Horsford with a terse order from the Secretary of War: "Case of concentrated ration referred to Commissary General with direction to carry into effort General Grant's recommendation immediately." Horsford sent a copy of Grant's letter to Commissary General Eaton, enclosing his own note suggesting that they work together in harmony to introduce the ration.[300] Horsford was elated by his bureaucratic coup, but wary of the task ahead. "I [have] now begun to realize the elephant I have caught, but I have got the game in my hands wholly, and I hope I shall be able to play it," he wrote to Phoebe.[301]

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[297] Ibid.

[298] Ulysses Simpson Grant, The Papers of Ulysses S. Grant: November 16, 1864-February 20, 1865 (SIU Press, 1967), 425–26. Horsford to Phoebe Gardiner Horsford, February 15, 1865, U. S. Grant to Stanton, February 15, 1865, Horsford Family Papers. RPI.

[299] Copy of Grant's letter dated Feb. 15, 1865, City Point, Va. RPI

[300] Horsford to Eaton, February 18, 1865. Folder Horsford, E. N. (Prof) (1864-65) Marching Ration. National Archives.

[301] Eben Norton Horsford to Phoebe Gardiner Horsford, February 18, 1865 Horsford Family Papers, Phoebe Horsford. RPI.

Within a month Horsford had the manufacturing plans for his ration in place, ready for a summer shipment to the army. He contracted with the firm of Miles and Holman to manufacture the dried grain ration, and with the American Desiccating Company—which made dried vegetables—to make the meat ration. He personally supervised the work at the American Desiccating Company, but even so the manufacturing did not always go smoothly. In early March 1865, Horsford reported to Phoebe that the beef was "delicious," better than he expected, and that he would send her a box of it; but later that month he reported that if he did not watch the manufacturing process closely everything would go wrong.[302] When not at the factory supervising the work himself Horsford received assurances from the proprietor that despite occasional batches that spoiled, the work of preparing the meat ration was proceeding splendidly.[303]

Horsford's plan for packing the ration was based on his laboratory experiments. The method for preservation he worked out at the Smithsonian had kept individual rations of meat and bread fresh and ready to eat for months. He scaled up for factory production accordingly, and tried to keep the packaging light and small. The bread was wrapped in strong paper, two rations to a package, and sealed in pine boxes containing two hundred rations each. The meat rations were sealed in tin cases that held five blocks, at five hundred rations to a case, and these cases were put up in pine boxes to be shipped to Union soldiers occupying Texas and Louisiana.[304] Horsford assumed that this would

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[302] Eben Norton Horsford to Phoebe Gardiner Horsford, March 8 and 21, 1865 Horsford Family Papers, Phoebe Horsford. RPI.

[303] George Hatch to Horsford, May 26, 1865 and June 7, 1865, Box 74 Folder 9, Subseries d, American Civil War Army Rations Series A, Eben Norton Horsford, Record Group IV Horsford Family, Sylvester Manor Archive, MSS 208. Fales Library and Special Collections, New York University Libraries.

[304] Horsford to Eaton, March 15, 1865. Folder Horsford, E. N. (1865 Washington D.C.) (Prof). National Archives.

be enough to keep the ration fresh and delicious for months, as it was protected from contaminants that might attack it from the air.[305]

The assumption that these precautions would prevent the food from rotting was shared by Horsford's opponents and detractors alike. The major debating points of the board and Horsford were about the body's need for nutrients and just how much savings would result from the adoption of the ration, not whether it would spoil. In the absence of a bacteriological theory of spoilage, all the experts involved did not suspect that the ration would rot from the inside. It was, however, very likely to do so. The wheat was highly hygroscopic, drawing moisture to itself and therefore providing an attractive home for mold and weevils. Woodward had noted this during his investigations of the ration. When he dried the wheat, he was only able to remove about 14 percent of the water weight, in contrast to Horsford's claim of 20 percent. When Woodward left the desiccated wheat out in the laboratory, it rapidly regained about 6 percent of its original weight in moisture.[306] Woodward only considered this to be a problem because of weight gain, not because of the potential for the wheat to become moldy. Horsford's condensed beef was likewise quite vulnerable to decay. The lack of an interior preservative was its fatal flaw. Grinding meat for sausage mixed the bacteria on the surface into the interior; once a sausage was mixed, stuffed into casings, and hung to cure, it could be a perfect environment for bacterial growth. Saltpeter (potassium nitrate) had long been used by butchers to preserve the bright red color of cured meat and to

[305] A. C. Hamlin to Charles Thomas, August 11, 1864. Folder Horsford, E.N. (Prof) 1864 Marching Ration. National Archives.

[306] J. J. Woodward to J. K. Barnes, July 26, 1864. Folder Horsford, E. N. (Prof) 1864 Marching Ration. National Archives.

prevent it from spoiling,[307] but Horsford thought that saltpeter would destroy the nutritious phosphates of the meat so he had decided not to use it.[308]

The ration's potential for spoilage was discovered during the trial in the summer and fall of 1865, when many cases of Horsford's meat and bread rotted in transit to the South. An inventory sent back to headquarters by a commissary officer in New Orleans noted that the rations were unfit for issue: the meat was moldy and rotten, the bread full of weevils. The ration "should have been packed in air-tight tin cases," he noted on his report.[309] In some cases, the men declined to draw the rations, on the orders of their commanding officers. A commissary officer in Shreveport, Louisiana, had received 45,000 rations each of the meat and bread ration and intended to issue it to a brigade of 4,000 cavalry troops, but the brigade commissary officers refused to take them. The Shreveport officer later found out that General Wesley Merritt had examined a box of the rations, found them to be bad, and ordered the commissary officers under his command to not issue the ration.[310]

Some boxes of rations did arrive in an edible condition, but when eaten, the food produced stomach complaints. Nor it did not seem to provide a satisfactory amount of nutriment. A commissary officer in the Ringgold Barracks in Texas reported that he ate the ration, but that he did not think it was a good substitute for hard or soft bread, particularly as it was too small; he often consumed two portions of it at one meal and was still hungry afterward.[311] A surgeon stationed at

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[307] Harold McGee, *On Food and Cooking: The Science and Lore of the Kitchen* (New York: Simon and Schuster, 2007), 173–74. Imperfectly cured sausages had long been a notorious source of illness, particularly botulism; botulus is Latin for "sausage."

[308] Horsford, *The Army Ration*, 7, 27.

[309] J. J. Haskell, "Inventory and Inspection Report," November 13, 1865. Folder Horsford, E. N. (Prof) (1865 Washington D.C.) National Archives.

[310] Charles H. Thompson to H. Covice, September 16, 1865. Folder Horsford, E. N. (Prof) (1865 Washington D.C.) National Archives.

[311] Charles H. Morse to R. C. Shannon, December 9, 1865. Folder Horsford E. N. (Prof) (1864-65) Marching Ration. National Archives.

the same barracks condemned the ration as unhealthful and indigestible, producing colic and diarrhea in the men. He also criticized the experiment as a whole, questioning the wisdom of trying out an unproven ration on "men just recovering from the debilitating effects of an entire change of climate, the ravages of the scurvy, and other diseases consequent upon a deficient supply of proper and nutritious food."[312] The trial of Horsford's ration was a failure, and Horsford left Washington to return to the Rumford Chemical Works. He eventually amassed a fortune from manufacturing baking powder and other chemicals. He never tried to make a condensed ration again, and hardtack and salt meat remained part of the US Army ration up through World War I.[313]

The insistence of the physicians in the Army Medical Department on American distinctiveness and the inadmissibility of chemistry as a means for designing a diet can be seen as a mark of their conservatism, but it is not an indication that they held outmoded ideas. Instead, it was Horsford who pushed the envelope of acceptability, challenging widely held assumptions about diet. Medical resistance to the authority of chemistry over diet was to erode slowly over the course of the nineteenth and early twentieth century, as physiological chemistry gained a foothold in medical schools thanks to the medical education reform effort spurred on by men like Woodward.[314] In the Sanitary Commission's 1867 medical history of the war, surgeon and brevet Lieutenant Colonel Sanford B. Hunt wrote that Horsford's ration was "able and well-directed, though not quite successful," and he encouraged Horsford to continue to develop the project.[315] Hunt himself used a

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[312] Granville Rodgers to H.M. Hutchins, December 7, 1865. Folder Horsford E. N. (Prof) (1864-65) Marching Ration. National Archives.

[313] Risch, *Quartermaster Support of the Army*, 683.

[314] Robert E. Kohler, *From Medical Chemistry to Biochemistry: The Making of a Biomedical Discipline* (Cambridge University Press, 1982).

[315] Sanford B. Hunt, "Army Alimentation and Disease" in Flint, *Contributions Relating to the Causation and Prevention of Disease, and to Camp Diseases*, 94.

chemical accounting of nutrients to make recommendations for an ideal American army ration for future wars, anchored by an ample supply of nitrogen in the form of fresh beef. By the 1890s, enough harmony existed between medicine and chemistry on the subject of military rations that a surgeon in the US Army could publish a chemical analysis of army diets in the pages of the *Journal of the American Medical Association*.[316]

In the 1860s, the medical notion of the importance of individual distinctiveness in diet retained enough of a hold over physicians that they rejected the very idea that chemistry served as a guide for designing a diet. Yet nutrition science in the hands of chemists like Horsford in the 1860s had taken ahold of a central element of nutrition science as it was developing: the notion that it was possible to determine how much food was needed to support a certain amount of labor, and then to design a diet that would meet those needs. This work rested on professional expertise in the natural sciences, whose developing confidence in their mastery of human metabolism were lending a solidity to scientists' claims to expertise about human diet. Even Horsford's effort to design a ration for the Union Army was a step forward in the development of nutrition as a social question, even when the technical hurdles for accurately estimating people's dietary needs, let alone creating an ideal ration to meet them, were far too high to be surmounted.

[316] Charles Woodruff, "The US Army Ration and Military Food," *Journal of the American Medical Association* 19, no. 23 (December 3, 1892): 651–63.

Chapter 4: To Make the Most of Man: W.O. Atwater's Social Thought

Tucked in the midst of his technical treatise on methods for nutrition science research, the chemist and physiologist Wilbur Olin Atwater (1844-1907) waxed philosophical about the aims for his science. After analyzing the different dietary standards developed by Carl von Voit, Jacob Moleschott, Lyon Playfair, and other European scientists, Atwater argued that the experiences of American workers suggested that the right amount of food for man should be set at more than his European colleagues thought was correct. The crux of the issue, Atwater wrote, was the fact that European dietaries tended to contain just enough food to allow a person to live and work, and did not take into account the possibility that more food would be needed to raise people to a higher level of productive capacity. Atwater, as an American scientist and an observer of local conditions, thought that the more ample American diet bore a close relationship to the high level of productive capacity that he thought was found in the American worker, and that these standards for both diet and productivity could be emulated worldwide. "The thesis which I attempt to defend," Atwater wrote, "is that to make the most of a man … to enable him to live as a man ought to live, he must be better fed than he would be by these standards. The principle is one that reaches very deep into the philosophy of human living."[317]

For Atwater, then, the crux of nutrition was about the relationship of food and diet to human flourishing, and specifically how a population's standard of diet corresponded to a nation's productive capacity. Atwater saw his work as having an urgent cast, as he saw it as linked to broader problems facing the United States. Like many intellectuals in the 1890s, Atwater understood the relationship between labor and capital as the preeminent problem of the day, a problem that was

[317] W. O. Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food* (Washington, Govt. Print. Off., 1895), 211, http://archive.org/details/methodsresultsof21atwa.

commonly referred to as "the social question."[318] Dramatic upheavals such as the 1893 economic depression, as well as the Pullman Strike and march on Washington by Coxey's Army the following year, made it clear that workers' concerns were not sufficiently addressed by the present economic system. Among the many proposed solutions to the labor question, ranging from Socialism on the left to violent repression of unionism on the right, was to frame it as one of community and cooperation. The idea was to find a common solution to social problems by finding a middle ground between labor and capital. In the words of Jane Addams, the leader of Hull-House and an occasional Atwater collaborator, American society in the 1890s was "passing from an age of individualism into one of association," and while it might be difficult to bring everyone together into a group, this effort "may represent a finer social quality and have a greater social value" than individual action.[319] Atwater was steeped in this ideology of communal action. For him, nutrition science was a means to help solve the social question; nutrition for him was a collective endeavor that required concerted effort to get all of society to agree on the best mode of eating and living. People would eat better, waste less, and thus "raise society to a higher moral as well as physical plane."[320] This might seem like an odd aim for a nutrition scientist, but it was a vision that Atwater deeply believed in and earnestly sought.

This chapter examines Atwater's ambitions for nutrition science by reconstructing his ideas from his letters and speeches, and by relating them to a broader network of interlocutors in social and religious philanthropy. Atwater's vision for nutrition science was the culmination of nutrition as a social question: his work combined the focus on political economy of Bell, the deep religious

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[318] Alice O'Connor, *Social Science for What?: Philanthropy and the Social Question in a World Turned Rightside Up* (New York: Russell Sage Foundation, 2007).

[319] Jane Addams, *Democracy and Social Ethics* (New York: The Macmillan Company, 1915) p. 138.

[320] W.O. Atwater, "Food and Household Economics" lecture to the National Household Economic Association, October 15, 1901. Wilbur Olin Atwater papers, #2223. Division of Rare and Manuscript Collections, Cornell University Library. Hereafter Atwater Papers, Cornell.

convictions of Gould, and the faith in technocratic methods of Horsford to portray diet as an urgent, universal problem that could be solved with concerted scientific and philanthropic effort. Atwater's plan for nutrition science was closely related to analogous developments in economics and the social sciences, which began to shift researchers' attention to how their work could solve the social question. Atwater was also a devout Methodist and an active layman in the church, and he cultivated ties with the Social Gospel movement and settlement movement, groups that sought to spark collective action to solve social problems. In Atwater's hands, nutrition science was a way to ensure that the abundance of modern capitalist society was distributed more evenly throughout society so no one felt the pinch of want. If people knew how to properly spend their food budgets they would not commit the error of waste, nor would the broader economy be on the hook for letting people go without in the midst of plenty. To use the explicitly Christian terms that Atwater employed, we are our brother's keeper, whether that brother is within one's household or on the other side of the world.[321] Nutrition science, with its capacity for quantifying need and allocating resources, could help others make choices that were good for themselves and good for society.

On a public level, Atwater was an avatar of the scientific, social, and political ambitions that sat within nutrition science in the latter half of the nineteenth century, as he sought to expand the explanatory power of nutrition research and draw formal links to political economy and sociology. As will be explored more fully in chapter 5, Atwater's foremost role was as a chemist and physiologist who forged a research program that encompassed both field research on Americans' dietary habits and intricate laboratory work on human metabolism.[322] As much as he was a

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[321] W.O. Atwater, letter to unspecified correspondent, February 13, 1894, Box 6, W.O. Atwater papers (uncatalogued) Archives & Special Collections, Wesleyan University. Hereafter Atwater Papers, Wesleyan.

[322] Kenneth J. Carpenter, "The Life and Times of W. O. Atwater (1844–1907)," *The Journal of Nutrition* 124, no. 9 Suppl (September 1, 1994): 1707S–1714S; Kenneth J. Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition* (Cambridge: Cambridge University Press, 1994); Charles E. Rosenberg, *No Other Gods: On Science and American Social Thought* (Baltimore: The Johns Hopkins University Press, 1997); Philip J. Pauly, "The Struggle for Ignorance about

researcher, he was an institution builder and political operator who sought to convince others of the social value of his research. Atwater acted as a "hyphen," as he put it, connecting workers in disparate locations and fields: from physiological research institutes in Germany and France to provincial American experiment stations, and from clergymen to economists and sociologists. He was also an able publicist of his own work, writing popular articles and giving speeches about nutrition to a fascinated public. While his public face as a scientist and science popularizer was an important part of his work, this chapter focuses on the aspects of his thought that he did not readily talk about to his scientific colleagues: his social thought and religious faith, and how these ideas shaped his conception of the purpose of nutrition science.

This chapter's focus on Atwater's social thought is an intervention into the voluminous historiography on him in food studies, which tends to portray him as an arch-agent of social control, interested in policing the dietetic mores of the lower orders. Scholarly interest in Atwater was first sparked by the sociologist Naomi Aronson's work in the early 1980s, which argued that Atwater's focus on in the diet of the poor was a strategy for obtaining federal funding for his research. By framing the diet of the poor as a "social problem," she wrote Atwater attributed "poverty mainly to the bad dietary habits of the working classes." This turned the low standard of living of the poor into a technocratic problem that nutrition science could fix, rather than a problem of insufficient income that ought to be ameliorated by minimum wage laws and other redistributive policies.[323] Aronson's portrayal of Atwater as primarily motivated by a yen to control the diet of the lower classes has been an enduring one, replicated to a greater or lesser degree in several dissertations and

Alcohol: American Physiologists, Wilbur Olin Atwater, and the Woman's Christian Temperance Union," *Bulletin of the History of Medicine* 64, no. 3 (Fall 1990): 366–93.

[323] Naomi Aronson, "Nutrition as a Social Problem: A Case Study of Entrepreneurial Strategy in Science," *Social Problems* 29, no. 5 (June 1, 1982): 474–87, doi:10.2307/800397.

books that have appeared in the last thirty years.[324] Other works emphasizing the social control model of nutrition tie the development of standard diets to similar projects of regularizing the diet of the masses to produce desired social effects.[325] These works explore the popularization of a quantified language for nutrition, of which Atwater was a vocal proponent, and this language's subsequent use in bodily management through dieting, rationing, and other regimes for limiting food consumption. Most of these works have relied heavily on Atwater's popular articles for *The Century* magazine in the 1880s and 90s. This chapter takes a different tack, relying on his extensive correspondence with colleagues in science, government, and reform and religious circles rather than solely his published work. By examining Atwater's correspondence it becomes clear that Atwater was prone to be more voluble about his religious ideas and social thought in private epistolary discussions with his fellow social reformers rather than in the public sphere. The "private side" of Atwater paints a different picture of his motives as a scientist and social reformer than his published works do, as this chapter will show. Further, my treatment of Atwater's thought centers him within the intellectual history of the Gilded Age, focusing on liberal economic and religious thought that deeply influenced Atwater's conception of the aims of nutrition science. This chapter presents Atwater's science as an expression of his social beliefs. Atwater's work was ultimately about finding

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[324] Levenstein, *Revolution at the Table: The Transformation of the American Diet*; Deborah I. Levine, "Managing American Bodies: Diet, Nutrition and Obesity in America, 1840-1920" (Harvard University, 2008); Chin Jou, "Controlling Consumption: The Origins of Modern American Ideas about Food, Eating, and Fat, 1886-1930" (Ph.D., Princeton University, 2009), Jessica Mudry, *Measured Meals: Nutrition in America* (Albany: State University of New York, 2009); Charlotte Biltekoff, *Eating Right in America: The Cultural Politics of Food and Health* (Durham: Duke University Press, 2013). E. Melanie DuPuis, *Dangerous Digestion: The Politics of American Dietary Advice*, 1st ed. (University of California Press, 2015), p. 67.

[325] Cullather, Nick. "The Foreign Policy of the Calorie." *The American Historical Review* 112, no. 2 (April 1, 2007): 337–64. doi:10.2307/4136605. Treitel, C. "Food Science/Food Politics: Max Rubner and 'Rational Nutrition' in Fin-de-Siecle Berlin." edited by P. J. Atkins, P. Lummel, and D. J. Oddy, 51–62. International Commission for Research into European Food History; Food and the City in Europe since 1800. Aldershot, Ashgate, 2007; Veit, Helen Zoe. *Modern Food, Moral Food: Self-Control, Science, and the Rise of Modern American Eating in the Early Twentieth Century*. Chapel Hill: The University of North Carolina Press, 2013.

"the fundamental basis of human living,"[326] in his terms, as the first push toward intellectual and moral progress. He pinned tremendous hopes on this project: Atwater thought that better nourishment of the people was the ground upon which spiritual and social progress would grow, and his aim as a scientist was to bring this progress about.

Formulating Nutrition as a Social Question

"It is the food problem which is the important one to us," the *New York Times* declared in 1886. Readers who might not have previously thought of their diet as a "problem"—or, perhaps, not thought about it at all—were informed by the paper that "we ought to know what are the proportions [of meat, bread, and vegetables] to be used and how we should select them."[327] The explicit framing of diet as a social question was a novel one for the 1880s, and Atwater was the man who worked the hardest to plant this question into the public consciousness. Atwater thought of nutrition science as a tool for human betterment. This first section of the chapter briefly sketches Atwater's biography and some of the sources of his conception of nutrition as a social question before turning to two developments that shaped his work: changes in economic thought, and ideas about the proper role of government in solving social problems.

Atwater was born in 1844, the son of a Methodist minister. He completed his undergraduate work at Wesleyan University in 1865 and subsequently studied chemistry at Yale's Sheffield School in the late 1860s, followed by two years of postgraduate work in Leipzig and Berlin. Atwater returned to Wesleyan in 1873 to serve as the school's first professor of chemistry. He had been lured there by a college trustee, Orange Judd, who published an agricultural magazine called the *Prairie Farmer* and

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[326]Atwater to Carroll Wright, October 16 1893, Atwater Papers, Cornell.

[327] "The Cost of Food: We Eat More Meat and More Sweets than Are Necessary," *The New York Times*, November 6, 1886, http://query.nytimes.com/gst/abstract.html?res=F5091FFD345410738DDDAF0894D9415B8684F0D3.

who gave $100,000 to the college to fund a laboratory for agricultural chemistry. This allowed Atwater to focus primarily on research rather than teaching, an unusual arrangement at the time.[328] He stayed at Wesleyan for most of the rest of his career, with his time at the university punctuated by a stint as the director of the Office of Experiment Stations in Washington as well as frequent trips to visit colleagues in Europe, including a pivotal 1882 term studying methods for conducting nitrogen balance trials under Carl von Voit at the Munich Physiological Institute. His specialty in the early part of his career was agricultural chemistry, analyzing fertilizers and feeds for the profit of the farmer. Like Eben Norton Horsford, Atwater was part of a mid-to-late-nineteenth-century wave of European-trained American scientists who brought back both advanced techniques and a new vision for how science should be conducted. Atwater met with better fortune in his academic career than Horsford did, and became a staunch proponent of state funding for science as well as one of the chief beneficiaries of federal funding. Much of the money for this initial phase of his work came from the Connecticut legislature, with the US Departments of Agriculture and Labor and the Carnegie Institution chipping in in later decades. His interest shifted to human nutrition after he was asked by the US Commissioner of Fisheries to chemically analyze the nutritional content of the different species of fish eaten in the country.[329] Analysis of foodstuffs remained a significant part of the research in Atwater's lab, alongside studies of metabolism using a respiration calorimeter and surveys of the diets of different classes of Americans.

The impetus for Atwater's turn toward nutrition science as a tool for social amelioration was his perception of a close relationship between people's productive power and their nutrition. The inadequacy of many peoples' dietaries and the value of supplementing them to help them flourish was made plain to Atwater via a conversation he had over lunch with the chemist Lyon Playfair in

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[328] George E. Peterson, *The New England College in the Age of the University* (Amherst: Amherst College Press, 1964), 115.
[329] Carpenter, "The Life and Times of W. O. Atwater (1844–1907)."

1892. Playfair told Atwater about a school for Jewish children in London that received a subsidy to buy bread and milk from Baron Rothchild. The children who received extra food scored higher on their exams, leading Atwater to conclude in a letter to his wife Marcia,

> … the children of poor people are underfed at home and giving them a little more to eat helps them to do a great deal better in their studies. You can see what a telling thing this is for me with my theory of the nutrition of the underfed poor. One of these days I am going to announce the theses: The majority of mankind are underfed they live on a low nutritive plane. Their physical intellectual and moral elevation is contingent upon the raising of this plane of nutrition. Of course this is not the only factor but it is an essential factor. It is a rather startling thesis but I believe I can back it up.[330]

Observations like this one, which suggested a direct relationship between ample diet and human flourishing, lay at the heart of Atwater's research, and animated the rest of his work. Atwater was not the only observer to note this connection, however. The Italian economist Francisco Nitti noted that every productive activity was an expenditure of human force, and for this force to be sustained over time a proportional intake of food was needed to support it. This could be seen by observations of the health and productive capacity of various groups. Nitti was from Naples, and he argued that the reputed laziness of Southern Italian workers was not constitutional, it was due to a protein-deficient diet that left them weak and unable to work. Nitti argued that the fundamental problem of modern societies was the need for a more equitable distribution of force and an improved economy in the employment of that force: essentially, the best possible nourishment at the least possible expense. Further, Nitti argued that studies of the conditions of existence of different groups of average people would help uncover a law connecting food, labor power, and the strength of nations. This law would proceed from the social sciences to the biological sciences, just as other fundamental biological laws had proceeded from work in the social sciences:

> The differentiation of functions and its corollary the division of labour, as the law

[330] Atwater to Marcia Atwater, February, 1892, Box 1 Folder 1, Series II Wilbur Olin Atwater 1863-1989. Atwater Papers, Wesleyan. Emphasis in the original.

> of vital competition, has been from the first the conquest of social science; and it is only from it that we have gone on to biology. Under this aspect we see Smith preceding modern biologists and Malthus preceding Darwin. The law binding the labour-power of nations to their system of diet is not yet a definite conquest of physiology and has only reached the stage of an empirical truth based on the researches of statistics.[331]

Just as Adam Smith and Robert Malthus's theories served as essential intellectual background to the development of the biological theory of evolution, social-scientific investigations into the "collective life of peoples"—their labor, conditions of living, and diet—will help formulate a broader physiological law linking diet to a nation's vitality and productive power. Atwater was deeply interested in Nitti's work; he read this article at least twice, and recommended it to others.[332]

Atwater argued that the broader public should understand nutrition by relating the market price of foods to the protein and energy values it contained. In 1884, Atwater gave a paper to the American Association for the Advancement of Science on this topic, putting forth the notion that the best foods are ones that delivered the maximum nutrition at the lowest cost. Taking the "cost per calorie" into account would help lower the cost of living for many, as many workers spent about half their income on food. Atwater was by no means the only nutrition scientist to trumpet this idea—his German colleague Max Rubner also tried to popularize the notion that beans and other cheap sources of protein should substitute for choice cuts of beef and other delicacies, ensuring the same amount of nutrition for less cost—but Atwater was its chief promoter in the United States.[333] The notion that workers (and everyone else besides) should lower their costs of living was a central

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[331] Francesco S. Nitti, "The Food and Labour-Power of Nations," *The Economic Journal* 6, no. 21 (March 1896): 37.

[332] Atwater to Carroll Wright, August 11, 1902, Box 1, Folder 1, Archives Administration Files of the Carnegie Institution for Science. Hereafter Carnegie Institution.

[333] Corinna Treitel, "Max Rubner and the Biopolitics of Rational Nutrition," *Central European History* 41, no. 01 (March 19, 2008), doi:10.1017/S0008938908000022; C. Treitel, "Food Science/Food Politics: Max Rubner and 'Rational Nutrition' in Fin-de-Siecle Berlin," ed. P. J. Atkins, P. Lummel, and D. J. Oddy, International Commission for Research into European Food History; Food and the City in Europe since 1800 (Aldershot, Ashgate, 2007), 51–62.

point of his popular writings in the late 1880s.[334] He held that even the "most intelligent people," by which he meant the educated classes, knew less about the actual uses and values of their food than about nearly any other subject that bore on daily life.[335]

Armed with this message, Atwater became an in-demand public speaker and magazine writer. He wrote for *The Century* and *The Forum,* publications noted for their educated, affluent readership and their editorial focus on the social problems of the day. As his research was funded through the US Departments of Agriculture and Labor, Atwater was under pressure to show the social utility of his research. His articles in the *Century* and *Forum* were odes to the usefulness and beauty of physiological research as well as the value of his particular subfield, in the hopes that his affluent readership would develop an interest in his ideas. Atwater told a colleague that his popular writing was "pot boiling," or stoking demand for his scientific work.[336] Taken in isolation, these articles present a picture of Atwater's nutrition science as a simple hybrid of physiology and household economy: the body is a machine, it could be fed any sort of fuel, and so the best fuel is the cheapest and simplest. These articles, however, expressed only a portion of the ideas that had animated Atwater's work, displaying only what he cared to write for the public in the 1880s and early 1890s. During this period Atwater was immersed in the broader intellectual ferment of the period, which helped him develop ideas about how physiological science could be put to broader social use.

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[334] See, e.g. Atwater, "How Food Nourishes the Body," *The Century Magazine*, June 1887; Atwater, "The Chemistry of Food and Nutrition," *The Century Magazine*, May 1887; Atwater, "The Potential Energy of Food," *The Century Magazine*, July 1887; Atwater, "Pecuniary Economy of Food," *The Century Magazine*, January 1888; Atwater, "The Food-Supply of the Future," *The Century Magazine*, November 1891.

[335] W. O. Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food* (Washington, Govt. Print. Off., 1895), p. 136.

[336]Atwater to Wiley, May 13, 1892. Atwater Papers, Cornell.

Inequality and Economics in the Gilded Age

By the turn of the twentieth century, social scientists had begun to question some of the received wisdom of nineteenth-century political economy in an effort to explore the social question. These shifts influenced Atwater's conception of nutrition as a social question, and so they are worth exploring in detail. On the one hand, liberal intellectuals could hardly fail to note the unprecedented economic progress of their era, driven by the country's rapid rate of industrialization. Americans in the last two decades of the nineteenth century enjoyed huge leaps in economic productivity, wealth, and improvements in infrastructure. On the other hand, it was abundantly clear that inequality and poverty were increasing. Economists began to note that the rising tide had lifted some boats much higher than others, and that they ought to undertake an engineering project to control the waters. This was in keeping with a shift in the moral tone of American economics at the end of the century, pushed forward by men the historian Bradley Bateman dubs the "ethical economists": their economics was one that emphasized fairness, justice, and social amelioration.[337] Richard Ely, for example, returned from studying economics in Germany in 1880 and made a vow to write on behalf of the laboring classes.[338] Other economists in this period started to do the same. In his 1879 book *Progress and Poverty*, the economist Henry George upended one of the accepted tenets of economics, namely that material wealth and progress increased together.[339] The economist Simon Patten agreed with George that inequalities would not fix themselves; he theorized that industrialization had

[337] Bradley W. Bateman, "Clearing the Ground: The Demise of the Social Gospel Movement and the Rise of Neoclassicism in American Economics," *History of Political Economy* 30, no. Supplement (January 1, 1998): 29–52, doi:10.1215/00182702-30-Supplement-29.

[338] Ross, *The Origins of American Social Science*, 105.

[339] Nancy Cohen, *The Reconstruction of American Liberalism, 1865-1914* (Chapel Hill: University of North Carolina Press, 2002), 143–44.

created an age of abundance where poverty could be eradicated by an equal distribution of goods.[340] In the view of George and Patten, distribution was the linchpin of a more equitable society. This would not come about through socialist revolution and forced nationalization of goods, but by keeping both producers and consumers on a leash; both needed to be tamed in order to use resources wisely.

Economists' focus on distribution as a way to solve the social question had further implications for social thought in the period, beyond the potential for curbing the excesses of capitalism and consumerism. To some, it seemed possible that the grip of Thomas Malthus's law of population could be loosened.[341] Malthus's theory held that periods of abundance would inevitably lead to an increase in the birth rate, followed by a subsequent period of sickness and starvation that would correct the excess population growth. But to some American observers at the end of the century it seemed possible that the abundance of consumer society had broken this cycle, and the poor could both increase and survive. The notion that Malthus could be reversed was popular with devout Christians, Patten and George among them, who did not think that a benevolent God would design a world that would let the poor waste away for lack of resources. Further, they believed that a laissez-faire approach to political economy—where the poor would starve if they could not shift for themselves—violated Christian morality and republican values. George contended that Mathusianism left too little room for the possibility of social change. In his view, poverty followed no natural law; it was a human creation, engendered by an unequal distribution of wealth that allowed some to hoard resources while others were left without. He argued that attributing poverty

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[340] Mina Julia Carson, *Settlement Folk: Social Thought and the American Settlement Movement, 1885-1930* (Chicago: University of Chicago Press, 1990), 156.

[341] I do not wish to suggest that fear of a demographic crisis were entirely effaced with the eclipse of Malthus. In certain sectors "race suicide" had become the prime threat to the US population, and many turn-of-the-century Progressive economists, including Simon Patten and Richard Ely, were also eugenicists. Thomas C. Leonard, *Illiberal Reformers: Race, Eugenics, and American Economics in the Progressive Era* (Princeton and Oxford: Princeton University Press, 2016).

to Malthusian cycles was merely an intellectual fig leaf used by monopolists and conservatives to justify the status quo.[342] Patten, for his part, thought that scarcity had already ceased to be the normal pattern of life in modern society. Nevertheless, inequality persisted because the wealthy had horded this surplus for themselves. National prosperity could be achieved by making sure that production was regular, prices were stable, distribution was uniform, and consumption habits were temperate. Crucially, production and consumption had to be kept in check together, as overproduction would be self-indulgently squandered if the public was not educated in the proper consumption of the goods produced.[343]

The notion that cycles of abundance and scarcity were a thing of the past was a crucial part of nutrition as a social question in the late nineteenth century. If Malthus had been eclipsed, the food problem could be even more focused on the question of making sure that everyone could obtain their fair share of the abundance. As one observer noted, as soon as free institutions, general intelligence, and science and invention began to stimulate the energy of people to create, it was a certain thing that the time would come when the world's possible production would exceed the world's possible demand.[344] Indeed, it seemed to be already happening. One observer noted that from 1865-1885, there was a 27 percent increase in the number of bushels of grain produced in the US; burgeoning agricultural production combined with the advent of the railway to speed food to consumers meant that the cost of food was falling.[345] To Atwater, this kind of development was the

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[342] Edward T. O'Donnell, *Henry George and the Crisis of Inequality: Progress and Poverty in the Gilded Age* (New York: Columbia University Press, 2015), pp. 42-47. Fred Nicklason, "Henry George: Social Gospeller" *American Quarterly* 22:3 (1970) pp. 649-664.

[343] Daniel M. Fox, *The Discovery of Abundance: Simon N. Patten and the Transformation of Social Theory* (Ithaca: Cornell University Press, 1967) p. 47.

[344] Albion W. Tourgee, "The Reversal of Malthus," *American Journal of Sociology* 2, no. 1 (1896): 13–24.

[345] Edward Atkinson, "The Food Question in America and Europe: Or, the Public Victualing Department," *Century Illustrated Magazine* 33, no. 2 (December 1886): 238.

culmination of a century of progress. Atwater thought that the rapidly expanding productivity of American agriculture and the abundance of the country's food supply meant that all could share in the wealth. As he wrote to US Senator Joseph Hawley, "It looks like a piece of errant optimism to say that density of a population is a condition, not of scarcity, but of cheapness and abundance of food; but when you come to look into the matter is there not really ground to it?"[346] Taken as a whole, technological optimism, a belief that Europe and North America were entering into a permanent age of progress, and a sense that any difficulties that arose could be ironed out in time helped give the Atwater the impression that the food problem would be immanently solved by redistributing foodstuffs and making sure the surplus was not wasted.

Amid this celebratory vision of a world without want, Atwater turned his attention to finding simple ways to ensure that alimentary abundance could be shared and not wasted. This was the reason his popular writings in the 1880s and early 1890s were so singularly focused on convincing people to buy and consume foods that offered a favorable ratio of cost to nutrients. One of his main points of advice to consumers of all income levels was to buy only inexpensive food. It was folly to spend extra money on expensive cuts of meat when the cheaper cuts delivered just as much nutrition for a smaller price, he argued. His insistence, almost to the point of self-parody, that the price of food should dictate one's choices in the market has opened him up to the charge by contemporary scholars that his work was to subordinate the pleasures of eating to a mere accounting of calories and grams of protein.[347] It is clear that Atwater's popularization of quantified measurements for eating was a forerunner to later efforts to popularize calorie-counting as a way to

[346]Atwater to Joseph Hawley, July 2, 1892. Atwater Papers, Cornell.

[347] Mudry, *Measured Meals: Nutrition in America*.

avoid getting fat.[348] But it does not follow that Atwater had that end in mind. He took a disinterested view of fatness and instead strenuously objected to waste.

His was a top-down view of a people's nutrition, comparing national ratios of production and consumption of food and looking for ways to make it more efficient. For example, in an 1889 letter to the Yale Sheffield School botanist W.H. Brewer, Atwater claimed that "our meat product at present is abnormal. We are engaged in the stupendous economic blunder of converting immense quantities of soil product, in the forms of protein, fats, and carbohydrates of corn and grass ... into the fat of beef and especially pork, in quantities far in excess of the demands of consumers."[349] To consumers of meat, his message was personal. People of all classes bought too much meat only to waste it, by throwing perfectly good foodstuffs away or by buying more than they needed. "I judge the disorder to be essentially Anglo-Saxon, quite prevalent in England, and epidemic in the United States," he wrote, contrasting Americans' careless habits to the frugality that he thought prevailed in Europe, where people ate less in general and not one scrap was wasted by a family.[350] In Atwater's view, if scarcity was no longer a problem in the United States, it would be a small matter to get people to change their habits for the better, and this was why his popular writing was marked by its singular focus on encouraging people to consume the most nutrient-dense foods at the lowest cost.

Putting Nutrition Science to Work in Government

Atwater thought that the state had a role, albeit a limited one, in helping to improve a country's nutrition. In this he followed a broader line of thought promulgated by liberals in the Gilded Age. As the historian Nancy Cohen has noted, American liberalism in the 1890s was

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[348] See, e.g. Lulu Hunt Peters, *Diet and Health, With Key to the Calories*, [9th ed.] (Chicago,: The Reilly and Lee Co., 1921).

[349]Atwater to W.H. Brewer, Sept. 23 1889. Atwater Papers, Cornell.

[350] W.O. Atwater, "Pecuniary Economy of Food," *The Century Magazine*, January 1888.

interested in defining an active role for the state in the economy and society, but that this role ought to be a circumscribed one.[351] In the case of the social question—and by extension, nutrition seen as a social question—government should facilitate systematic inquiry into social problems and then step back and allow voluntary groups to apply and disseminate this knowledge. Atwater's work exemplified this general orientation toward the state's role in solving the social question. He very ably solicited federal funding for his research and turned the USDA bulletins into a publishing arm of his laboratory, yet he resisted incursions that might turn the USDA toward more interventionist approaches to improving the people's nutrition.

A look at Atwater's collaborators in government bears this out. Atwater's closest colleague was Carroll Wright, the US Commissioner of Labor. Wright and Atwater began working together on creating data about the diet and habits of the working class when Wright was the Labor Secretary of Massachusetts and commissioned Atwater to conduct a dietary study of workers in the state's mill towns.[352] While a Republican when he served in the Massachusetts state senate, Wright avoided partisanship when he was named for the Massachusetts labor bureau in the 1870s. In this post he garnered a reputation as a reformer with even-handed views on labor issues and industry. Atwater and Wright continued to collaborate when Wright was named head of the Federal Labor Bureau in the 1880s. Funding Atwater's research was in line with Wright's goal of making the Federal Bureau of Labor into a clearing house for information and educational materials, one that was separate from politics.[353] As Atwater wrote to his laboratory assistants in 1892, Wright was very interested in placing Atwater's food investigations as part of a project of understanding the wages and production of American workers. In so doing, Wright was making the Department of Labor one of

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[351] Cohen, *The Reconstruction of American Liberalism, 1865-1914*, 4.

[352] Carroll Davidson Wright, *Food Consumption: Quantities, Costs, and Nutrients of Food-Materials* (Boston: Wright & Potter Print. Co., state printers, 1886).

[353] Mary O. Furner, *Advocacy & Objectivity: A Crisis in the Professionalization of American Social Science, 1865-1905*, p. 47.

the foremost institutions in Washington for investigating social conditions.[354] Atwater was particularly pleased by Wright's patronage, as the commissioner asked him in 1892 to prepare the way for a large investigation into food and food economy, involving collecting dietaries in Europe, calorimeter work and methods for investigating heats of combustion, along with analyses of food materials and improvements in making these analyses. Wright promised funding to the tune of $1,000 to do so, even providing support for basic chemical research. In his letter thanking Wright, Atwater told him that "If our plans do not miscarry I believe we shall do something that will help us to die happier."[355]

Wright's reputation as an impartial reformer who was singularly focused on the facts was the reason for his appointment as the first US Commissioner of Labor; labor advocates in the 1880s had been clamoring to have a cabinet-level post to represent their perspectives, and Wright was appointed because he was thought to split the difference between the interests of labor and capital. His own writing bears this out; even when writing for *The Forum* on wages and the cost of living, Wright confined his commentary to a recitation of wage levels and commodity price statistics rather than making any kind of argument about how workers lived their lives or the responsibilities of employers.[356] Wright sought to strike a balance between the interests of capital and labor. His work on the 1894 Pullman Strike bore this out: his report placed the blame for the railway company's losses and the violence of the strike on the company itself, as its owners had refused to bargain with workers to diminish their anger. However, he thought that striking was a violent and barbarous activity to begin with, and so workers were wrong to do it. Wright advocated what he considered to be responsible unionism, regulated by the government to ensure the public interest. This stance

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[354] Daniel T. Rodgers, *Atlantic Crossings: Social Politics in a Progressive Age* (Cambridge, Mass.: Belknap Press of Harvard University Press, 1998), 62.

[355] Atwater to Wright, June 11, 1892. Atwater Papers, Cornell.

[356] Carroll D. Wright, "Cheaper Living and the Rise of Wages," *The Forum*, October 1893.

made him a moderate on the labor question in comparison with the judiciary, which ruled that nearly any collective action was illegal, and the executive branch under President Grover Cleveland, which sent in the military to break up the Pullman Strike. By the 1890s, when Wright began his work with Atwater in earnest, he had become a prominent advocate of the legal recognition and prudent regulation of labor unions.[357]

If solving any social question meant amassing a disinterested collection of facts and figures, it followed that Atwater's vision for the US Department of Agriculture Experiment Stations, which he ran in the late 1880s, was to make them into factories for producing basic facts. Shifting the focus of the experiment stations toward the study of human nutrition rather than agriculture required Atwater to convince his superiors that the change was necessary, and so in the late 1880s Atwater enlisted the help of the New England textile magnate Edward Atkinson to help convince the Secretary of Agriculture, J. Sterling Morton, to fund Atwater's studies of human food.[358] Atkinson, a self-taught economist and political gadfly, was known for his support for free trade and his rabid anti-union views, coupled with his interest in improving the lot of the poor through various schemes, their diet chief among them. He was also a vocal proponent of schemes to improve the workers' diet. Atkinson was a backer of the New England Kitchen, an enterprise in Boston that provided cheap meals to the poor, as well as the inventor of a cooking box called the Aladdin oven that cooked food inexpensively by using very little fuel.[359] On the face of it, Atwater and Atkinson had similar interests and proffered similar solutions to the food problem.. The chemist collected

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[357] Cohen, *The Reconstruction of American Liberalism, 1865-1914*.

[358] Levenstein, *Revolution at the Table: The Transformation of the American Diet*, 45.

[359] The New England Kitchen and Atkinson's influence on the direction of nutrition in America have been particularly emphasized in the historiography of late nineteenth-century nutrition science. Levenstein, *Revolution at the Table: The Transformation of the American Diet*; Biltekoff, *Eating Right in America: The Cultural Politics of Food and Health*; Aronson, "Nutrition as a Social Problem"; Laura Shapiro, *Perfection Salad: Women and Cooking at the Turn of the Century* (University of California Press, 2008); E. Melanie DuPuis, *Dangerous Digestion: The Politics of American Dietary Advice*, 1st ed. (University of California Press, 2015), http://www.jstor.org.ezproxy.library.wisc.edu/stable/10.1525/j.ctt19632c5.

statistics on the prices of food for Atkinson's publications, and he helped correct the facts in Atkinson's 1896 book *The Science of Nutrition*.

However, the two men had differing views for how nutrition ought to be seen as a social question, which led to a conflict in the early 1890s over the role the USDA experiment stations ought to play in food research. The conflict illustrates the liminal status of basic scientific research in the period, and the extent to which Atwater and Alfred Charles True, his hand-picked director of the Office of Experiment Stations, had to push to ensure that their agenda for nutrition science was the dominant one. As the historian of medicine Charles Rosenberg has noted, Atwater and especially True had to continually exhort the experiment stations to concentrate their efforts on basic research rather than routine analyses or inoculations for farm animals, and threaten to pull funding if the stations did not maintain their focus on research.[360] In the early 1890s, Atkinson had convinced Morton that the USDA experiment stations ought to have a narrower, more practical focus than Atwater wanted. Atkinson saw himself as the missing link between "you scientificusses," as he put it in a letter to Atwater, and practical men.[361] He intended to turn the Agricultural Experiment Stations into food laboratories along the lines of the New England Kitchen. The kinds of projects he envisioned would focus exclusively on waste; in particular, how to cook food in the most efficient manner in order to minimize the amount of food thrown out.[362] Though Atwater believed in the importance of teaching people to choose foods wisely and learn to cook them economically, he thought these tasks ought to take come after basic research; USDA should fund the more purely scientific work of making dietary studies and conducting physiological experiments

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[360] Rosenberg, *No Other Gods: On Science and American Social Thought*, 175.

[361] Atkinson to Atwater, November 28, 1893. Atwater Papers, Cornell.

[362] Edward Atkinson, *Suggestions for the Establishment of Food Laboratories in Connection With Agricultural Experiment Stations*, US Department of Agriculture Office of Experiment Stations, Bulletin No. 17 (Washington, D.C.: Government Printing Office, 1893).

first. As he told one ally, a former head of the USDA experiment stations, he didn't see that it was feasible for the department or the stations to "establish soup houses, restaurants, or other establishments in the line of the New England Kitchen which [Atkinson] proposes."[363] Atkinson, for his part, urged the Secretary of Agriculture to marginalize Atwater's work, advocating that the Secretary put someone with "less science and more horse sense," (as Atwater archly put it to a colleague) in the position of leading the USDA's nutrition research agenda.[364]

Atkinson's pull with Secretary Morton was enough to pose a threat to Atwater and his allies at the Office of Experiment Stations, and so they tried to defend their work. Alfred Charles True, the director of the Office of Experiment Stations after Harris, asked Atwater to prepare a "dignified statement of the nature of your office, of the difficulties of your work, of the present condition of the enterprise, and of the prospect of accumulating results [in the form of published reports] as time goes on," in order to prove the value of his research. Even with such a statement in hand, True was convinced that Secretary would not continue to fund Atwater's research beyond July 1893, and instead would shift the nature of the work of the stations toward issuing press bulletins and other popular fare. In the end, Atwater was able to convince Secretary Morton of the value of abstract scientific work. As he wrote to Harris, Atwater had a frank talk with Morton about the food investigations, and at its conclusion Morton "was persuaded that we both had the same end in view, though doubtless there would be more or less question about the methods." After this bureaucratic skirmish, Atkinson kept up his efforts to have his ideas about cheap cookery for the poor implemented by the Department of Agriculture, to Atwater's increasing resistance and chagrin. Atwater testily noted to True in October 1893 that Atkinson should be "be made to see where he

[363] Atwater to Harris, June 12, 1894, Atwater Papers, Cornell.

[364] Atwater to Harris, October 3, 1893, Atwater Papers, Cornell.

will stand" if he continued to push for his ideas.[365] In particular, Atwater did not want Atkinson's cooking schemes to sully the pages of his purely scientific USDA bulletins. He told True to omit an engraving of the Aladdin cooker in a bulletin on the food investigations, calling the picture a "positively wretched disfigurement" that would put off the "best scientific men" from reading the bulletin.[366] The correspondence between Atwater and Atkinson dropped off after their scrap over funding, with Atwater's letters taking on a snide tone that was not in keeping with his usual epistolary courtesy.[367]

The tussle about the proper orientation of the experiment stations was essentially about the proper way to see nutrition as a social question. Atwater and Wright agreed that the role of government was to facilitate the collection of the basic facts of living, like labor statistics and analysis of food materials, and then to make these fact widely known. In this Wright and Atwater shared the views of many workers in social politics in the late nineteenth century; they were not interested in having the state take on the responsibilities of social welfare. Instead, government should subsidize the efforts of voluntary organizations, like mutual aid societies, settlement houses and labor unions.[368] Likewise, for Atwater, the federal government ought to fund scientific research but should otherwise leave social reform up to philanthropic societies. Atwater did not have the welfare state as an end goal; instead, he sought to set a middle course between economic individualism and statism. Government would not "take hold of the matter thoroughly until the

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[365] Atwater to True, October 6, 1893, Atwater Papers, Cornell.
[366] Atwater to True, March 13, 1895, Atwater Papers, Cornell.

[367] See, e.g., Atwater to Atkinson, August 4, 1895. Atwater Papers, Cornell.

[368]Daniel T. Rodgers, *Atlantic Crossings: Social Politics in a Progressive Age* (Cambridge, Mass.: Belknap Press of Harvard University Press, 1998), 28.

need, the feasibility, the usefulness and the proper methods have been demonstrated" by private philanthropy, as Atwater wrote to a philanthropist colleague.[369]

The Scientist and the Social Gospel

As a prominent Methodist layman, Atwater gave a number of addresses to religious organizations about the food problem. In November 1896 alone, Atwater received three requests for speeches and articles from Protestant groups of various denominations who wanted his thoughts on food and diet in relation to Christian life.[370] While Atwater generally observed a social firewall between his scientific colleagues and his friends in religious philanthropy, there was no corresponding separation between his science and his faith, and this can be shown from the way he addressed the question in speeches to church groups and in his writings to his religious friends. This section of the chapter analyzes how Atwater conceived of the relationship between religion and nutrition science, putting Atwater's ideas in context with his interlocutors in the Social Gospel and Settlement movement.

Part of the reason why historians have missed the role of religion in Atwater's thought was that he tended to hold his religious idealism close to the vest in the 1880s and 90s, knowing that his faith set him apart from the majority of his scientific colleagues. He told the Congregational Union in 1897 that many of his friends were "not moved, they are not inspired, they are not brought into the church and kept in the church and kept in the sympathy with it" by church doctrines.[371]

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[369] Atwater to R. Fulton Cutting, March 19, 1894. Atwater Papers, Cornell.

[370] John Collins to Atwater, November 18 1896, P.N. Chase to Atwater, November 18 1896, William Kincaid to Atwater, November 23 1896. Box 4, Uncatalogued Items, Atwater Papers, Wesleyan.

[371] Atwater, Address before the Congregational Union, January 25, 1897. Atwater Papers, Cornell.

However, his friends were moved by a philanthropic impulse that Atwater thought was essentially Christian. Atwater argued that the church should emphasize social outreach activities that were in accord with its principles: the alleviation of human suffering and the betterment of the world. The best means for improving humanity as well as drawing more people to the church would be to pay attention to the material welfare of the people.

While he felt free to thunder about food production and consumption in *The Forum* and *The Century Magazine,* he was more circumspect about his religious beliefs and their influence on his social thought. He was "not anxious to air his pet theories," as he wrote to a clergyman friend, perhaps out of a sense of apprehension about appearing too religious for his secular scientific colleagues.[372] Instead, he only discussed his social theories with his interlocutors in the clergy and in philanthropy. To one man, Atwater wrote that he had a

> thesis which one of these days I may perhaps nail on some door, namely, that man is only on the way toward his highest physical, intellectual, and moral development and one condition of his rising to where he ought to be is better nourishment. There are some corollaries of this proposition one of which will perhaps fail to receive the full approval of the missionary societies. It is that the gospel alone cannot elevate the heathen. Their bodies must be better nourished before their souls can fully utilize the spiritual food which we have been trying to supply them.[373]

The reference to Luther's 95 theses was not a casual one. Atwater's linkage of the humble facts of human nutrition to the lofty notion of man's reaching his highest forms of development was the animating idea of his life's work.

The notion that people had to be materially comfortable before they could be receptive to the gospel was a central part of his bond with religious reformers. Atwater was particularly close to religious reformers, and shared belief was an important bond between Atwater and his friends in

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[372]Atwater to Haynes, March 16, 1893 Atwater Papers, Cornell.

[373]Atwater to Gen. Joseph Hawley, July 2, 1892. Atwater Papers, Cornell.

philanthropy who worked directly with the project's subjects. In his communications with his religious colleagues, Atwater emphasized the notion that solving the food problem would be the first footing for a broader movement of evangelism. He further brought workers into the project who had the religious aspects of the work in mind. To this point, Atwater's friend, the physician Isabelle Delaney, was an essential go-between for allowing the dietary study researchers access to their subjects for the New York City studies.[374] She and her sister ran the Catherine Mission on the Lower East Side, which was a charity and missionary society. Through her medical practice Delaney was acquainted with about 400 families from neighborhood. Delaney saw the connections between nutrition and her religious work. She told Atwater that the evangelical aspect of her mission was insufficient without first attempting to make alterations in their neighbors' standard of living. "We must go to their homes and help them improve their ways of living," she wrote, "and the place to begin is at the table."[375] Atwater evoked the same language of sympathy and science to recommend his assistant H.B. Gibson to the Reverend George H. McGrew of St. Bartholomew's Church of New York City. Gibson shared Atwater's perspective on the social value of the research, having "the makeup of an investigator and the appreciation of the importance of applying his science to the study of our burning social questions," Atwater wrote. "What is more he is an earnest Christian man and views these subjects from the Christian standpoint," which meant solidarity with the poor.[376] That being said, it was not essential for Atwater that all of his deputies share an appreciation of the social mission of the work. In keeping with the general division of how talked about his work with

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[374] Wilber Olin Atwater and Charles Dayton Woods, *Dietary Studies in New York City in 1895 and 1896* (US Government Printing Office, 1898).

[375] Atwater to Isabelle Delaney, May 9, 1895, W.O. Atwater, Address before the Congregational Union, New York City, January 25, 1897 Atwater Papers, Cornell.

[376] Atwater to Rev. George H. McGrew, July 6, 1893, Atwater Papers, Cornell. Gibson never worked on the New York City studies. He had been hired by the University of Missouri to run their chemical laboratory, and conducted the dietary studies at Missouri until his death from an unspecified illness a few years later. "General News Items" *The General Practitioner* 1 no. 10 (1896) p. 220.

others, Atwater wrote about his work in strictly scientific terms to his scientist colleagues, and discussed its religious and sociological aspects with his reformer friends.

While Atwater may have been an outlier among physiologists and chemists in his religious devotion, he had comrades in economics and social philanthropy. Atwater had deep affinities with the Social Gospel movement, a loose affiliation of religious reformers dedicated to tackling urban social problems through direct action. Social Gospelers were primarily Protestants of various denominations, and they considered their faith to be the national religion. The Social Gospel wove together science and faith: adherents believed in the value of social scientific research for eradicating poverty and other social pathologies. They were convinced that sociology and economics would validate their views and approaches, and that the broader public would adopt them once the good news was widely known.[377] This belief existed alongside a conviction the Kingdom of God was an earthly utopia that could be brought about in America.

Despite being firmly in the hands of the comfortable middle classes, the Social Gospel movement also held a core of critique of a social and economic system that produced such widespread poverty and misery. This critique accompanied a mandate to find ways to fix it on a practical level. Theologically speaking, all men were brothers under Christ; scientifically speaking, the language of the social organism seemed to validate the notion that problems in one part of the social organism ought to be ameliorated by faithful efforts from another part of the organism.[378] This orientation toward active work toward the remediation of social ills marks the chief difference between the Social Gospel and other turn-of-the-century adherents of social evolution. A core tenet of this outlook was the view that God's method for affecting progress was growth and

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[377] Steven Stritt, "The First Faith-Based Movement: The Religious Roots of Social Progressivism in America (1880-1912) in Historical Perspective," *Journal of Sociology and Social Welfare* 41 (2014): [i]-2.

[378] Carson, *Settlement Folk*, 10.

development. Where the Social Gospelers differed from Herbert Spencer and his American followers, like the sociologist Lester Frank Ward, was that their outlook was anything but laissez-faire; they intended to actively remove social ills rather than assume that evolutionary processes would eradicate them without direct human intervention.[379] Social science, therefore, was essential to the Social Gospelers for linking rational scientific thought and methodology to a higher purpose. Any push for reform had to be grounded in evidence, but animated by personal sympathy and Christian responsibility for others. As the economist and Social Gospeler Ely wrote, social solidarity was "one of the profoundest laws of the world, and brings before us a truth of science, of history, and of religion."[380]

Atwater was a particular adherent of the work of the clergyman Josiah Strong, who was one of the loudest voices in the Social Gospel movement in the 1890s. Strong was not a prominent intellectual, but his work was a crucial rallying point for social reformers. Strong's 1885 bestseller *Our Country,* which argued that the immigrant masses in large cities were endangering the Anglo-Saxon portion of the country, Atwater found a trifle overwrought, but he voiced high praise for Strong's second book *The New Era* (1893).[381] In *The New Era,* Strong struck a less alarmist tone, one that was a theological echo of the economic ideas of Patten and George. Strong argued that men of the 1890s were living through a period of transition; great social changes were underway, driven by

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[379] Cecil Greek, *The Religious Roots of American Sociology (*New York and London: Garland Publishing, 1992) pp. 51, 59, 66.

[380] Richard Theodore Ely, *The Social Law of Service* (New York, Eaton & Mains, 1896), 58, http://archive.org/details/sociallawofservi00elyr Atwater was friendly enough with Ely to arrange to have their sons room together at Phillips Exeter. Ely to Atwater, July 3, 1901, Box 5, Folder 26, Atwater Family Papers, Wesleyan.

[381] The extent to which Atwater shared Strong's racial panic is unclear. In both *Our Country* and *The New Era*, Strong voiced the fear of many Gilded-Age racists who argued that Anglo-Saxons, the race of civilization and progress, would be outbred and overrun by inferior races immigrating to the US and proliferating in cities. My preliminary evidence from Atwater's letters is clear on the fact that he thought that Anglo-Saxons sat at the top of a racial hierarchy. I do not have evidence to suggest that he believed immigration posed a threat to this hierarchy, especially as he thought that his work could bring everyone up to the high (Anglo-Saxon American) standard of living. However, since a fear of immigration was a common enough view among white people at the time, it would be surprising if Atwater disagreed with it.

scientific progress, and that the coming twentieth century would be the beginning of a new era of progress and prosperity. However, this progress was not preordained: the church had a pivotal role to play in bringing it about. Strong thought of the church as the conscience of the social organism, which ought to augment its traditional focus on evangelism by leveraging science to help solve social problems. Labor was one of the problems that Strong thought the Church could solve. He thought that workmen's discontent was justified, considering the fact that the benefits of prosperity had not been shared equally, and that their agitation was a sign of social evolution on the march.[382]

Atwater also had ties with the Settlement movement, which sharpened his focus on the importance of educating the masses about their diet and how to improve it. One of the first settlement house founders, Robert Woods of Andover House in Boston, told Atwater that organizations like his were useful for getting access to the people, but they were "only a kind of entering wedge" for the harder work of getting close to the people and earning their trust so they can be taught.[383] The two men shared a vision of scientific philanthropy that combined the clinical objectivity of the scientist with the subjectivity of a person in full sympathy with his neighbors. This was the vision of the settlement house movement in general. Settlement house workers would be scientists in a new kind of laboratory for the social sciences, Woods wrote in the *American Journal of Sociology* in 1897, one where the settlement worker could study his neighbors though close, friendly association and note all aspects of their lives, from their income and expenditures to their health and moral habits.[384] While Atwater's main interlocutor among settlement house workers was Woods, Atwater also knew and admired Jane Addams, whom he met while living in Chicago during the 1893

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[382] Josiah Strong, *The New Era: Or, The Coming Kingdom* (The Baker & Taylor co, 1893), http://archive.org/details/neweraorcomingk01strogoog.

[383]Robert Woods to Atwater, February 21, 1894. Atwater Papers, Cornell.

[384] Carson, *Settlement Folk*, 64–65.

World's Fair.[385] As Jane Addams put it in a 1899 article, the settlement house was a tool for putting knowledge to use where it would be most needed. The aim was to "use this knowledge synthetically and directly whatever knowledge, they as a group, may possess, to test its validity and to discover the conditions under which this knowledge may be employed."[386]

The ideal of Christian simplicity and sympathy for the lower orders was exemplified for Atwater and for many of the Social Gospelers by the Russian novelist Leo Tolstoy. Tolstoy's novels and essays from the 1850s through the 1880s were translated into English in one fell swoop between 1885-1890. Americans received all of Tolstoy all at once, which had the effect of compressing decades of his social thought into one (somewhat contradictory) mass. However, the jumble of beliefs and practices that made up Tolstoy's social thought—non-resistant pacifism, agrarian communitarianism, rational Christianity, vegetarianism, chastity, and temperance—dovetailed nicely with ideas already present in the American intellectual scene to the extent that the Russian novelist served as an intellectual lodestar. For example, the Unitarian minister Edward Everett Hale founded a Tolstoi Club among his parishioners and students at Harvard. The club was an association for social work, and it later evolved into a settlement house.[387] Likewise, Addams and others made pilgrimages to Yasnaya Polyana, the count's country estate, to meet with the man himself, see the school and model houses he had built for his peasants, and talk about ideas.[388]

Atwater deeply admired the Russian novelist, and was a reader of his religious and philosophical though as outlined in his books, *My Religion* and *My Confession*. In 1897, Atwater

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[385] Atwater to Helen Atwater, August 14, 1893, Box 4 Folder 26, Atwater Family Papers, Wesleyan.

[386] Jane Addams, "A Function of the Social Settlement," *The Annals of the American Academy of Political and Social Science,* 13 (1899) pp. 33-55.

[387] Harry Walsh, "The Tolstoyan Episode in American Social Thought," *American Studies* 17, no. 1 (1976): 49–68.

[388] George Kennan, "A Visit to Count Tolstoi," *The Century Magazine*, June 1887, 252–65; Jean Bethke Elshtain, *Jane Addams and the Dream of American Democracy: A Life* (New York: Basic Books, 2002), 157.

traveled to the novelist's estate in Russia. The fact that he managed to do so was part of his zeal for travel, but also indicates Atwater's deep interest in the man and his work, considering he traveled there from Tbilisi, Georgia, over a thousand miles away. After touring the estate and before dining with his family, Atwater sat in Tolstoy's study to chat. During their conversation Tolstoy told Atwater that scientific research did not pay enough attention to "things connected with the daily life of the people," including their diet. "Whether he knew that was a hobby of mine I don't know," Atwater acknowledged, but he was happy to discuss the subject with the novelist, telling him about some of his ideas about "food in its relation to work and welfare, individual and national," Atwater wrote to his daughter Helen.[389] Then they moved on to ethics and sociology. Tolstoy said that one's Christian duty consisted in service to others, and in giving more than they receive. He criticized the church in particular for neglecting this duty. Naturally, Atwater didn't agree with this last point, "and told him so very frankly," he reported.[390]

Atwater saw Tolstoy as a moralist and social reformer who did good through practical labors. He admired the Russian's holy simplicity and his willingness to profess only the teachings of Jesus as exemplified by the Sermon on the Mount rather than put his faith under the auspices of the organized church. Atwater was also impressed by the ways in which Tolstoy put his beliefs into practical form, such as the school for peasant children at Yasnaya Polyana. Atwater's appreciation for the novelist can be seen as a reflection of his own self conception: he saw both himself and Tolstoy as practical men animated by the highest ethical concerns. It is possible that Tolstoy himself understood this; the chemist described sitting with Tolstoy and having the older man look into the

[389] Atwater to Helen Atwater, September 19, 1897, Box 4 Folder 17 Atwater Family Papers, Wesleyan.

[390] *Ibid.*

bottom of his soul and ask him if he did not accept his teaching simply because of his own human selfishness. Atwater did not report answering the question.[391]

Atwater's vision for nutrition science was steeped in Christian social thought, which encompassed economics, sociology, and theology into a practical vision of social betterment. His nutrition science was a means for finding out the basic facts of human living, through laboratory study of metabolism and the chemistry of foods, coupled with dietary studies that aimed to find out how people fed themselves in their own homes. Once the facts were known, nutritional standards could be set and educational programs put in place that would help raise everyone's standard of living by allowing for an equal distribution of the abundance of modern consumer society. If Atwater thought of himself as somewhat akin to Tolstoy—an educated man, a man of deep religious conviction, and dedicated to improving the daily life of the people—he was too modest to suggest it outright. Yet his visit to the novelist's estate and his later writings on the subject suggest that the meeting deeply impressed him.

Education as Uplift

Education was a linchpin of Social Gospel thought; in fact, it held the wheel of social evolution on its axis. Voluntarism, rather than state compulsion, would bring about social change; the power of Christian love would be the powerful yet slow engine for gradual improvement. For Atwater, too, education was an essential tool for improving popular nutrition, and this belief was one of the reasons for his many public articles and speeches about nutrition. Most social Gospelers had a "trickle-down" vision for social change, in which the most active and intelligent of the population would first adopt the right rules for living and then the rest of the population would

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[391] W.O. Atwater, "Tolstoi in Russia," Atwater Papers, Cornell.

learn by example. As Atwater wrote to the Rev. Dr. F.B. Hartranft of the Hartford Theological Seminary, "I doubt whether much can be done at present in the lowest stratum but I do believe that, among those several strata from the next above the lowest [and] upward, there are many who are ready to accept and apply the doctrines of rational food economy. We must gradually get at the real facts, select those which are most usual, spread them among the more intelligent people, and let them gradually filter down and through the masses."[392] Once the correct rules for diet were found and popularized, the broader public would have their basic needs taken care of and would be more receptive to the Gospel.

Yet Atwater's focus on education raises the question of whether learning about proper diet would be the means for solving the labor question. Atwater was not blind to the fact that America in the 1890s was starkly unequal, with a vast gulf separating the wealthy and the working classes. He knew that the workers spent about half of their income on food; this was a fact that he proclaimed in many of his speeches and articles. Further, he was well aware of popular discontent among laborers and he thought that their grievances were legitimate. As he told a conference of home economists, in an echo of Josiah Strong's writings, "The real fact is that the masses are discontented because they have come to see that the world offers so much that is desirable and they have so little of it."[393] He contended that this discontent was salutary, as it led to social progress. It was a result of progress as well: people on the whole were better educated and more intelligent than their forebears. They were "clamoring for a new order of things," and this struggle would help bring about social progress, as people pushed to better themselves and their world.

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[392]Atwater to F.B. Hartranft, June 29 1894 Atwater Papers, Cornell.

[393] W.O. Atwater, Address to the National Household Economic Association, Buffalo, N.Y. October 15 1901, Atwater Papers, Cornell.

Despite his sympathies with the workers' calls for change, Atwater was a classical liberal down to his well-shod toes, and he preferred incremental change to social upheaval. Minimum wage laws, welfare programs, or other systems of federally organized economic redistribution were not in the purview of liberal social reformers of the 1890s, and Atwater was no exception to this general rule.[394] Atwater thought that bringing intellectual life to the workers was a way to help quell unrest: a person who works with her hands should have mental stimulation alongside physical labor in order to be satisfied with her lot. He believed that the laborer was not only angry about small wages but also about being denied the satisfaction of mental activity. Manual labor ought to be made "more intellectual" which would render the work more necessary and noble. Education for workers therefore ought to focus on "how ordinary people can, under current conditions, make their lives most useful and successful and help others do the same," he wrote.[395] This kind of education would supposedly go a long way toward removing the workers' anger.

Animating the notion that education would solve the social problem was a strain in the culture of the intellectual elite in the country, that disdained the materialism of the Gilded Age and wished to return to a simple life. These middle-class advocates of simplicity were not interested in solidarity with the agrarian or proletarian movements, as the historian David Shi has noted.[396] Instead, their aim was to create "sympathy" between the upper and lower classes so that more radical attempts to solve the social problem would be forestalled.[397]As Atwater told the home economists, "plain living and high thinking make content." This statement could hardly fail to please a roomful of professionals dedicated to dignifying housework through scientific education, but it

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[394] Rodgers, *Atlantic Crossings: Social Politics in a Progressive Age*, 28.

[395] Atwater, "Industrial and Agricultural Education," Speech to the Cuban Conference of Charities and Corrections, Havana, Cuba, March 19-22, 1902, Atwater Papers, Cornell.

[396] David E. Shi, *The Simple Life: Plain Living and High Thinking in American Culture* (New York: Oxford University Press, 1985), 165.

[397] Ibid, p. 180.

likely would not have placated the members of the American Railway Union. It is clear that Atwater's "plain living" did not include giving up the pleasures of his work as a college professor for a job on a factory floor, any more than settlement workers were willing to exchange their bourgeois houses in bad neighborhoods for a laborer's tenement nearby.

At the same time, Atwater's focus on education was reaping practical results in terms of disseminating ideas about nutrition. Atwater boasted to British scientists in 1904 that a little USDA bulletin called "The Principles of Nutrition and Nutritive Value of Food" had enjoyed a print run of 50,000 copies annually for the past eight years.[398] This meant, to him, that there was a hunger for information about nutrition in the country and that his work in finding the facts about Americans' food consumption was both stoking and fulfilling that need. Atwater's most reliable partners in educating the public were home economists. Home economics, with its mission to imbue the homely aspects of life with scientific rigor, corresponded neatly with Atwater's belief that the intellectual life of the average person must be brought to a higher plane. One of Atwater's main interlocutors in the home economics movement was Ellen Swallow Richards of MIT, and she shared his notion that the point of home economics was to improve not just the house but also society as a whole.[399] As Atwater told the National Home Economics Association in 1901, universities had rightly "caught the new but rapidly growing sentiment which refuses no longer to recognize the 'aristocracy of science' and demands that it shall be made directly useful to the public at large," hence, many universities were establishing domestic science departments on same footing as history, economics, philosophy, agriculture, and other academic disciplines. The elevation of

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[398] Atwater, "Respiration Calorimeter," speech before the British Association for the Advancement of Science, August 24, 1904. Box 10 Uncatalogued Atwater Papers, Wesleyan.

[399] Sarah Stage, "Ellen Richards and the Social Significance of the Home Economics Movement," Sarah Stage and Virginia B Vincenti, eds., *Rethinking Home Economics: Women and the History of a Profession* (Ithaca, N.Y: Cornell University Press, 1997), 17–33.

home life to a science was "part of our natural aspiration for a higher intellectual and ethical life," Atwater said.[400]

In practice, though, the notion that home economists should spearhead educating the public about nutrition represented a gendered division of labor in nutrition. On the one hand, Atwater thought that some women were well-equipped for scientific labor and professional work. University education for young women should be oriented towards science, he told the home economics association. He thought it "very natural" that some women would want to work outside the home, and it was the duty of society to prepare them for it at college.[401] And he did put his hiring practices where his mouth was: home economists conducted a number of the dietary studies.[402] All the same, Atwater thought that education and professional life was only available to a few gifted women, and his assistants whose careers he promoted as research scientists and academics were all men. Most women, Atwater thought, were destined for wifehood and motherhood, terms he covered in the kind of sentimental glory that contained a modicum of condescension. Whatever a woman's income or class status, she needs to be "impressed with the sacredness of her calling, and to feel that whatever may be her lot or portion of life, she has failed of her fulfilling her true mission unless some home is made the brighter and purer and happier for some connection of hers with it," he said in an 1896 address to the Institutional Church League.[403] An education in domestic science would

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[400] Atwater, "Food and Household Economics," Oct. 15, 1901. Atwater Papers, Cornell.
[401] *Ibid.*

[402] H.B. Frissell and Isabel Bevier, *Dietary Studies of Negroes in Eastern Virginia in 1897 and 1898*, US Department of Agriculture Office of Experiment Stations 71 (Washington: Government Printing Office, 1899); Lydia Southard et al., *Dietary Studies in Boston and Springfield, Mass., Philadelphia, Pa., and Chicago, Ill.*, US Department of Agriculture Office of Experiment Stations Bulletin No. 129 (Washington DC: Government Printing Office, 1903), http://ufdc.ufl.edu/AA00014586/00001; Atwater, "Dietetics in Relation to Hospitals for the Insane" *Annual Report of the Office of Experiment Stations, 1904* (Washington: Government Printing Office, 1905) p. 475; Atwater to Shapleigh, August 10, 1894; Atwater to Marcia Atwater, September 13, 1893, Atwater Papers, Cornell.

[403] Atwater, "What the Church Can do Toward Improving the Food and Nutrition of the Masses" *The Outlook* vol 54 no. 18, 31 October 1896. pp. 793-4.

help dignify her labor, but housework did not hold the same status of professional work. Even women's labor in professional settings was a step removed from the world of men.

Nutrition Science and Social Justice

Seeing Atwater as an explicitly Christian thinker is a notable intervention into the historiography of nutrition science. The *fin-de-siècle* in the history of nutrition is commonly understood as a time when the science began to focus on the "efficiency" of the working classes and the emergence of the interventionist state, with its focus on government-run public welfare programs.[404] Atwater's work has commonly been understood by historians of nutrition as synonymous with this movement, due to his working under the auspices of the USDA as well as the fact that his chief scientific output was a set of nutritional standards that would set the paradigm for the dietary management of self and others. Without denying the ease with which dietary standards or concepts like the calorie could be adopted by governments, I have argued in this chapter that making nutrition into a tool of the state was not Atwater's chief aim for his work; it was instead to produce social facts that would help people raise themselves to a higher plane of living. Atwater's unique understanding of the role of his work suggests that there was not one nutrition science in the late nineteenth century, but instead several nutrition sciences, developed by different scientists to varied ends. Teasing out the distinctions among these competing visions will help give a more nuanced picture of what the late nineteenth-century builders of nutrition science thought they were constructing.

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[404] Elizabeth Neswald and David F. Smith, introduction to Elizabeth Neswald, David F. Smith, and Ulrike Thoms, *Setting Nutritional Standards: Theory, Policies, Practices* (Rochester, NY: University of Rochester Press, 2017) p. 12.

Atwater's positioning of Christian solidarity as the central aim of nutrition science put him at an ideological remove from his peers in Europe, who did not think of their discipline's social mission in quite the same terms. These distinctions might be characterized by a closer look at two politically engaged European scientists, the Dutch physiologist Jacob Moleschott and the German physiologist Max Rubner. Atwater knew both men, and the three shared the same scientific approaches and concepts that directed their attention to the people's nutrition. In essence, all three worked within the input-output model of metabolism, which understood metabolism as a series of energy exchanges. This view tied human diet to a society's economy and social structures. All three were engaged with the question of labor, and all three sketched out substantially different plans for a nutrition science that engaged with political and social affairs.

Moleschott, for his part, situated nutrition science at the nexus of political radicalism, materialist science, and the integration of scientific theory and practice.[405] A physiologist working in the mid to late nineteenth century, Moleschott was a participant in the 1848 Revolution and held the chair of physiology at Zurich and later in Turin, where he decided to move after the unification of Italy. As referenced in chapter three, Moleschott's materialist conception of the body suggested a direct relationship between the nutrients in a diet and physical and mental strength of its consumer. As he wrote in his 1852 book *The Science of Foodstuffs, for the People,* peasants who ate protein-poor foods were condemned to mental sluggishness and physical debility. For example, the potato diet of the Irish in the 1840s meant that the Irish had "potato blood" coursing through their veins; their physical diet made them too weak to throw off the colonial yoke of their beef eating British oppressors. By contrast the Irish who had emigrated to America were perfectly strong, because they

[405] Frederick Gregory, *Scientific Materialism in Nineteenth Century Germany* (Dordrecht-Holland & Boston, USA.: D. Reidel Publishing Company, 1977).

ate bread and meat.[406] Moleschott's notion of "potato blood" could only be taken seriously as a metaphor for the poor living conditions of the Irish rather then an actual physiological fact, as Moleschott well knew. The Dutch scientist once told Atwater he intended it to serve as a provocative illustration of the idea that physical and mental strength was a function of the material conditions of one's diet.[407] Even though Moleschott's "potato blood" was a simplification, it reflected his integration of radical politics and philosophical and scientific materialism. As he wrote in 1852, that the goal of the 1848 revolutions had been the "free and just distribution of force and matter … which makes labor possible, and through labor, an existence worthy of a human being."[408] Nutrition science, in Moleschott's hands, was to serve political liberation and support the material well being of the poor. His view of the connection between food and political strength was in keeping with the a broader discourse about the central importance of meat to the welfare of society and the state; for example, in an 1867 speech the scientist and statesman Rudolph Virchow argued that Germany would have to increase its meat consumption if it was to become a powerful nation.[409]

Standing in sharp contrast to Moleschott's interweaving of radical politics and nutrition science was the work of the physiologist Max Rubner, who had worked under Voit at the Munich Physiological Institute before becoming the chair of hygiene at the University of Berlin in 1891. Rubner forward a vision of "rational nutrition" linking dietary habits and labor efficiency into a system that could be intervened in by the state.[410] As the historian Anson Rabinbach has noted, the

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[406] Jacob Moleschott, *De l'Alimentation et Du Régime*, trans. Ferdinand Flocon, 3rd ed., 1858, 143, http://gallica.bnf.fr/ark:/12148/bpt6k6461317f.

[407] W.O. Atwater, "How Food Nourishes the Body," *The Century Magazine*, June 1887.

[408] Harmke Kamminga, "Nutrition for the People, or the Fate of Jacob Moleschott's Contest for a Humanist Science," Harmke Kamminga and Andrew Cunningham, eds., *The Science and Culture of Nutrition, 1840-1940* (Amsterdam ; Atlanta, GA: Roclopi, 1995), 15–47.

[409] Corinna Treitel, "How Vegetarians, Naturopaths, Scientists, and Physicians Unmade the Protein Standard in Modern Germany" in Elizabeth Neswald, David F. Smith, and Ulrike Thoms, *Setting Nutritional Standards: Theory, Policies, Practices* (Rochester, NY: University of Rochester Press, 2017), 52–73.

[410] Treitel, "Max Rubner and the Biopolitics of Rational Nutrition."

language of the conservation of energy allowed nineteenth-century thinkers to conflate various definitions of the term "power" such as labor force and the force of industrial machines.[411] Rubner was heir to this kind of thinking; Rubner was interested in thinking about the body as if the body-machine analogy was a literal one, in order to more closely correlate the diet of a worker and the amount of work that could be obtained from him. This was a very fruitful notion when applied to his studies of energy metabolism. Rubner was the originator of the isodynamic law in 1873, or the notion that one calorie contains the same amount of energy whether it be of protein, carbohydrates, or fat. He also found that the first law of thermodynamics, the conservation of energy, applies to animal metabolism.

From his post as the chair of hygiene at the University of Berlin, Rubner began to advise the German state, arguing that it had a vital interest in policing the dietary habits of the people. This was in keeping with the views of German industry in the 1880s that workers should receive enough food in order to be productive over the long term, and made provisions for the care of their workers in the factories themselves.[412] On a policy level, Rubner advocated a number of state interventions: workmen's kitchens, to ensure a cheap, nutritious lunch for laborers, restrictions on alcohol, to keep people from wasting money on beer, free lunches in schools, to ensure that children got the food they needed, and milk stations for infants in the cities. If the state ignored these crucial projects, Rubner warned, it risked an overall physical degeneration of the populace. In fact, such a degeneration was already taking place. One could see "the lowering of physical qualities which are especially observed among the young people in great cities and in industrial districts," Rubner said in 1912. "It is no more than self-preservation for the state to lend its aid in combating these

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411 Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (University of California Press, 1992), 125.

412 Dietrich Milles, "Working Capacity and Calorie Consumption: The History of Rational Physical Economy" in Kamminga and Cunningham, *The Science and Culture of Nutrition, 1840-1940*, 75–96.

conditions."[413] That same year, Rubner founded the Kaiser Wilhelm Institute for Labor Physiology, which was intended to bring the benefits of physiology to German industry and the military. For Rubner, the law of thermodynamics could serve as the basis for a broader program of social hygiene, encompassing diet, health, and labor.[414] Rubner's nutrition science was therefore explicitly statist and tied to labor efficiency to a degree unmatched by Atwater or Moleschott.[415]

The ideological differences among these major framers of nutrition does not add up a to a uniform view of the science's goals and aims at the turn of the century. Instead, the formation of the science was marked by a number of fissures separating the men who were trying to limn its purpose. Should improvements to popular nutrition be a goal of the state, or should this task be left to private philanthropy? Were the poor victims of a fundamentally unjust capitalist system that must be radically altered, or was their misery simply a byproduct of industrialization, one that could be fixed through adjustments in the distribution of resources? What was the ultimate aim of nutrition science: reaching peak efficiency for a state's workers, or achieving a higher plane of living? Should that higher plane be described in humanist-materialist terms, or explicitly Christian ones? These questions were not articulated explicitly by the framers of nutrition science. Instead they existed as subtext and competing assumptions about the purpose of research into popular nutrition. Atwater, too, left no manifesto for nutrition; he described his philosophy instead in his letters to his preacher friends and in speeches to church groups, and he glancingly alluded to it in a long treatise about the

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[413] Max Rubner, "The Nutrition of the People," in *Transactions of the Fifteenth International Congress on Hygiene and Demography*, ed. Albert Hassell, vol. 1 (Washington, D.C.: Government Printing Office, 1913), 385–407.

[414] Rabinbach, *The Human Motor*, 262–63.

[415] Rubner's vision of maximum dietary efficiency for the state came to a tragic end in World War I, when he was the architect of German food policy and presided over widespread hunger and malnutrition in the face of the Allies blockade of Germany. See Kristin Ann Ehrenberger, "The Politics of the Table: Nutrition and the Telescopic Body in Saxon Germany 1890-1935" (Ph.D. Dissertation, University of Illinois at Urbana-Campaign, 2014).

methodology of nutrition science.[416] These fragments of a mission statement for nutrition science—differences that were never formed into arguments, let along full-fledged debate among their proponents—remained in pieces in the twentieth century. Atwater's notion that the abundance of consumer society as a social good that ought to be shared, nutritional abundance was soon to shift in valence in the first two decades of the twentieth century as to be a source of dangerous excess; one had to stay away from eating too much in order to not become overweight.[417]

Atwater's untimely death was a factor in the loss of nutrition science's social mission. In 1904, Atwater was hoping that he would be named the director of an International Nutrition Institute funded by the Carnegie Institution, which would give him a bigger stage for his ideas than Wesleyan University.[418] Intimations of how he might have conceived of this new role can be found in a speech he gave to the physiology and economics section of the British Association for the Advancement of Science in Cambridge in August of that year. In this speech, Atwater told the physiologists that the working poor would be better nourished if they were instructed in food economy, but that even still, there were "a considerable number with us … who cannot provide themselves with adequate nourishment until their incomes are larger or their food is cheaper." He described the findings of British social researchers, who found that the working class in England spent most of their lives without adequate food, and asked for the scientists' attention to this problem. He argued that poor nutrition "was a question primarily of physiology, but also one of public welfare and public morals, and is it not worthy of consideration?"[419]

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[416] See, e.g. Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food* (Washington, Govt. Print. Off., 1895), p. 212.

[417] Hillel Schwartz, *Never Satisfied: A Cultural History of Diets, Fantasies, and Fat* (New York: Doubleday, 1986); Deborah I. Levine, "Managing American Bodies: Diet, Nutrition and Obesity in America, 1840-1920" (Harvard University, 2008). Chin Jou, "Controlling Consumption: The Origins of Modern American Ideas about Food, Eating, and Fat, 1886-1930" (Ph.D., Princeton University, 2009).

[418] Carpenter, "Life and Times of W.O. Atwater," p. 1713S

[419] Atwater, speech before the section on physiology and economics of the British Association for the Advancement of Science, Cambridge, August 23, 1904. Box 10, Uncatalogued Atwater Papers, Wesleyan.

Atwater appealed to his British colleagues to participate in an international effort to coordinate inquiries into the nutrition of people around the globe, in order to better understand the connection among wages, food prices, and health. This was Atwater's distillation of nutrition as a social question: he thought that research into the linkages among them would uncover a nutritional standard that could raise everyone to a higher plane of living, should they be induced to follow it. His work was deeply informed by his religious commitment to social betterment and in keeping with broader trends in the social sciences to link scientific work to moral concerns. The religious character of Atwater's agenda for nutrition science set him at a remove from his scientific contemporaries, but put him squarely in the company of other nineteenth-century social thinkers, for whom religious and moral concerns were inextricably tied to the question of how to ensure healthy bodies in a healthy society.

Chapter 5: Laying Out the Routes of Travel: the USDA Dietary Studies Project

In 1894, Atwater wrote to the settlement house founder Robert Woods and R. Fulton Cutting, the president of the New York Association for Improving the Condition of the Poor. Atwater solicited their help with a "sociological inquiry" into the diets of Americans. The project aimed to find representative families in representative American localities, and was designed to discover how these families bought food, how much they paid for it, how they cooked it, and overall, how well-fed they were from the dietary habits they practiced. The families in the study would have to be chosen for their "intelligence, desire to improve, and willingness to have their ways of living studied," Atwater told Woods and Cutting. Ideally the collaboration between the dietary study researchers and their subjects would allow both sides to learn from the interaction. The family could be taught practical means of improving the selection, purchase, cooking, and use of their food, information they could spread to their neighbors. For researchers and philanthropists, the project would gather basic data about the dietary habits of a large portion of the country. Atwater told Cutting and Woods that this was pioneering work. "It is the laying out of routes of travel," Atwater wrote. "It is the discovery of fundamental principles [of food economy] not merely to be applied in one place by one society for the benefit of its community but to reach far and wide and be broadly and permanently useful."[420]

Atwater saw the dietary studies project as an integral part of casting nutrition as a social question: the studies were part of his push to determine the relationship of nutrition to a people's productive power and general welfare. Undertaken in years 1893-1901, and published in a series of bulletins from the US Department of Agriculture, the project was intended to provide a broad

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[420] W.O. Atwater to R. Fulton Cutting and Robert Woods, Memorandum on Investigations of the Food Economy of the Laboring People, March 16, 1894. Wilbur Olin Atwater papers, #2223. Division of Rare and Manuscript Collections, Cornell University Library. Hereafter Atwater Papers, Cornell.

overview of the kind of foods eaten in the United States: their quantity, quality, nutritional value, cost, and which segments of the population ate them: urban and rural, rich and poor, and from a number of ethnicities, occupations, and regions, clustered in the Northeast but also extending west to California, New Mexico, and southern states like Missouri and Virginia.[421] There were over 300 studies of individual families, published by the USDA in 26 bulletins. By 1901, the dietary studies project had examined the food of over 10,000 people in total.[422] The purpose of the project was to gain a composite picture of the country's food needs, under the assumption that people consumed what their bodies needed to support life and work; this observational standard for diet would be contextualized alongside Atwater's laboratory studies of metabolism of matter and energy under different conditions of work and rest. Comparing experimental and observational studies would uncover whether people naturally ate according to their physiological needs.

Atwater conceived of the dietary studies project as a "scientific and sociological" one, designed to complement the social surveys of the American working classes undertaken by his colleagues in the settlement movement, bringing facts about food consumption into line with observations of wages, housing, education, and other social facts.[423] Once the basic facts of human nutrition had begun to be amassed in the late 1890s, Atwater moved toward creating institutions that would help nutrition researchers across the globe uncover the relationship of diet and productive power by coordinating research on food consumption and metabolism, building consensus on research methods, and providing a means for sharing results. Since Atwater considered Americans to be the best fed people in the world as well as the most productive, these dietary surveys of

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[421] Atwater to True, June 13, 1894. Atwater Papers, Cornell.

[422] Translation of L. Grandeau, "Agricultural Review" *Le Temps* May 7 1904, Box 10, Uncatalogued Atwater Papers, Wesleyan.

[423] Atwater to R. Fulton Cutting, March 19, 1894. Atwater Papers, Cornell.

Americans would help set a global standard for diet that would establish a benchmark for raising the entire world to a higher plane of living.

As it happened, Atwater suffered a fatal stroke just as the pieces of his program for finding an answer to the nutrition question were falling into place, and his project was never realized. Consequently, its novel methodological approach and ambitious social agenda has been largely overlooked by historians of science. Atwater's methodology has been aptly described by Elizabeth Neswald as a hybrid of field and laboratory studies, reflecting the unique status of nutrition as both a lab and a field science.[424] Starting from this insight, my analysis explores in more detail the kinds of field research deployed by Atwater, the avenues of social scientific inquiry he participated in, and the type of social intervention Atwater intended to make.

This chapter examines Atwater's dietary study project, his metabolism experiments, and the development of his dietary standard, to show how Atwater amassed his data, and how he took the first steps toward forging a broader global consensus about the right way to eat and live. My analysis of the dietary studies themselves reveal the project as part of a broader trend in the social sciences in the 1890s toward the creation of social surveys, which were intended to create data about the living conditions of the working classes.[425] Atwater's work was within this new style of research, which combined empirical measurements of income and living expenses with qualitative observational data about people's lives. His work also served as a resource for later social scientists who wished to assess the adequacy of the diets of specific working-class populations. The final section of the chapter examines the end of his agenda for nutrition research, showing the shift in

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[424] Elizabeth Neswald, "Nutritional Knowledge between the Lab and the Field: the search for Dietary Norms in the Late Nineteenth and Early Twentieth Centuries." Elizabeth Neswald, David F. Smith, and Ulrike Thoms, *Setting Nutritional Standards: Theory, Policies, Practices* (Rochester, NY: University of Rochester Press, 2017).

[425] Martin Bulmer, Kevin Bales, and Kathryn Kish Sklar, eds., *The Social Survey in Historical Perspective* (Cambridge; New York: Cambridge University Press, 1991).

personal, institutional, political and scientific conditions that made his attempt to frame nutrition as a social question—and find a solution for it—no longer tenable.

Metabolism studies in Munich and Middletown

Atwater's science was structured by the animal machine metaphor, with its focus on the input and output of energy and matter. This model for nutrition science was the dominant one until the first few decades of the twentieth century, when the advent of biochemistry shifted researchers' attention to the nutritional value of trace minerals in the diet, work that coalesced into vitamin research after the first World War. By 1875, physiologists understood that nutrients were not absorbed directly into the blood, and that instead they were broken down into smaller molecules: fats to fatty acids, proteins to peptones, so there was less of a reason to think that the nutrients ingested were used directly by the body for fuel. Further, they knew that these molecules were reassembled into new combinations, and that there may be further intermediary steps in metabolism, such as reductions and syntheses, that were as yet unknown to science. Even still, the input-output model that Liebig's work cemented into place in physiology remained foundational through the 1890s, in part due to the centrality of the respiration calorimeter in nutrition research, as it directed researchers' attention to determining a subject's intake of nutrients and output of waste.[426]

Atwater became an adept of Liebig's method in 1882, when he visited the Munich Physiological Institute to study German methods for conducting nitrogen balance trials. The approach taken to the study of human nutrition at Munich privileged the close experimental observation of energy expenditures in the body, narrowing the focus of nutrition to seeing the

[426] Frederic L. Holmes, "Introduction," in *Animal Chemistry; or Organic Chemistry in Its Application to Physiology and Pathology, by Justus Liebig*, ed. William Gregory, A Facsimile of the Cambridge Edition of 1842, no. 4 (New York: Johnson Reprint Corp, 1964), cxi; William Coleman, "Function: The Animal Machine," in *Biology in the Nineteenth Century: Problems of Form, Function, and Transformation* (New York: Wiley, 1971), 139.

purpose of food as "fuel" for labor.[427] Here Atwater worked alongside the physiologists Carl von Voit, Max Rubner, and Max von Pettenkofer, learning how to use the institute's respiration calorimeter. The apparatus, modeled after the bomb calorimeter, measured the intake of food and air and the output of heat, work, and waste products—solid, liquid, and gaseous—from an experimental subject. In doing so, it measured the energy used and produced by the body, seeing the body's metabolism as a kind of economy; an input of food equaled an output of a certain amount of work. The respiration apparatus at Munich consisted of an eight-foot square iron box where the experimental subject sat. A table nearby held devices for measuring the air that flowed into and out of the box. In addition, the subject's food and drink and his waste products were measured, weighed, and chemically analyzed, helping to give a nearly complete accounting of the energy exchanges in the body.

Atwater's trip to Munich shifted the direction of his research toward calorimetry and the quantitative measurement of diet. The respiration calorimeter was, for Atwater, "one of the most interesting devices of modern experimental science."[428] It brought the study of metabolism in line with the fundamental laws of the conservation of energy and matter, placing nutrition "upon a rational and simple basis," as he explained in an article for a popular magazine a few years after his stint in Munich.[429] In 1892, Atwater began to make plans to build a respiration apparatus at Wesleyan, working with a colleague, the physicist Edward Bennett Rosa. Atwater took the unusual step of obtaining funding from the US Department of Agriculture, the Department of Labor, and private donors to build the apparatus, which was completed two years after the project was begun. Atwater's respiration calorimeter was the first in the United States, and it was, according to Atwater,

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[427] Coleman, "Function: The Animal Machine."

[428] W.O. Atwater, "How Food Nourishes the Body," *The Century Magazine*, June 1887.

[429] Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food*, 100.

both larger and more accurate than its European predecessors. With it he studied the digestibility of foodstuffs and developed methods of measuring respiratory exchange as a way to gage energy consumption.[430] By 1902, Atwater and one of his assistants, Francis Gano Benedict, had designed a means to measure the amount of oxygen consumed by an experimental subject in the calorimeter. Atwater outlined an ambitious plan to study how the body uses oxygen, as well as the relationship between food and muscular work, and studies of body temperature under different conditions of work and rest, a research agenda that was cut short by his stroke in 1904.[431]

The Wesleyan calorimeter generated a fair amount of popular interest, due to Atwater's knack for publicity as well as the novelty of keeping a person in the box for days at a time. A Dr. Tower who spent five days in the Wesleyan calorimeter reported that the experience was much like going on a sea voyage.[432] He passed the time reading, writing, looking out the window, and talking to the experimenters on the telephone. Visitors liked to peer through the window at him; this made Tower "feel like the occupant of a zoological garden," he said.[433] Not only was the respiration apparatus time-consuming for the subject; it also required a lot of laboratory manpower. An assistant had to monitor the gauges at all times in order to adjust the temperature of the box to the

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[430] Wilbur Olin Atwater, *Report of Preliminary Investigations on the Metabolism of Nitrogen and Carbon in the Human Organism: With a Respiration Calorimeter of Special Construction* (US Government Printing Office, 1897); Wilbur Olin Atwater and Francis Gano Benedict, *A Respiration Calorimeter with Appliances for the Direct Determination of Oxygen* (Carnegie Institution of Washington, 1905).

[431] Atwater, "Questions for Study by Use of the Respiration Calorimeter," and "Tentative Plans for Special Investigation with Estimates of Cost," Box 1, Folder 1, Archives Administration Files of the Carnegie Institution for Science. Hereafter Carnegie Institution.

[432] It was not always exactly like a sea voyage. By 1903, Atwater had begun to study metabolism during muscular work by having a subject pedal a bicycle-ergometer while in the calorimeter while measurements of his body's core temperature were taken. To achieve more accurate measurements, Benedict devised "a form of recto-thermometer which has proven very satisfactory," as Atwater wrote in a grant application. "Wire connected with the galvanometer outside make it possible for an observer at a distance to make the observations with great accuracy to hundredths of a degree. It can be worn without discomfort by the man inside the respiration calorimeter even when he is riding the bicycle-ergometer." Atwater, "Tentative Plans for Special Investigation with Estimates of Cost," Undated document, probably 1903, Carnegie Institution.

[433] Atwater, lecture to the Sheffield School, March 15, 1901, Atwater Papers, Cornell.

temperature of the person inside, and this work required vigilance: the apparatus was sensitive enough that even the heat given off by the subject waking in the night to look at his watch would need to be recorded.

The goal of Atwater's laboratory and field research was to determine "the fundamental basis of human living." In Atwater's terms, this meant determining the amount of food a person would need to maintain his health under certain conditions of labor. The aim of this work was to determine dietary standards, focusing primarily on the amount of protein needed per person per day, as protein was considered to be the essential fuel for work.[434] Creating a standard that could fit everyone, however, involved a number of elisions and logical leaps, just as it had in decades prior. Both Atwater and his European colleagues assumed that the food requirements of a man performing strenuous labor could stand in for the needs of the broader mass of humanity. Function, in the form of physical labor, was thought by Voit and others to be a the best rule of thumb for setting dietary standards. Biometric data like height and weight were not sufficient for creating physiological norms for daily diet, as people of roughly the same size had widely varying needs.[435] Researchers' focus on manual laborers reflected the close alignment of nutrition science with political economy, as it assumed that the health of the worker was a fundamental economic building block for a country. Voit's standard, which he published in 1875, pictured the ideal man as a bricklayer who worked for 10 hours a day, and concluded that this labor required 118 grams of protein and 3,000 calories. Atwater's standard was still higher, suggesting that an American worker needed 125 grams of protein and 3,500 calories. These standards were based on both observation of men's eating habits and experimental inquiry into their nutritional needs. The high levels of

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[434] Carpenter, Kenneth J. *Protein and Energy: A Study of Changing Ideas in Nutrition*. (Cambridge: Cambridge University Press, 1994) p. 69.

[435] Hamilton C. Bowie, "Ueber Den Eiweissbedarf Eines Mittleren Arbeiters," *Zeitschrift Für Biologie* 15 (1879): 459–84 Cited in Neswald, "Nutritional Knowledge between the Lab and the field" .

protein called for in these standards reflected what people actually ate in Atwater's day, according to his surveys, and were buttressed by the assumption that meat was the essential food for maintaining health and vigor.

Atwater accounted for the different dietary requirements of women, elderly people, and children by assigning them dietary norms that were a fraction of the standard for adult men. This led to some odd assumptions. For example, the dietary studies were designed to assume that that women consumed eighty percent of a man's daily ration—a gross generalization, and this figure should not be taken to reflect researchers' beliefs about the economic value of women's labor nor an accurate assessment of what they did eat. Accordingly, Atwater made no attempt to treat the ratio figure as an immutable fact. Just as the dietary norm set for the average worker was never meant to be a rigid standard that would suit all people, the notion that women and children ate a set percentage less than men was nothing more than an arbitrary rule of thumb, reflecting both the difficulty of finding an average eating subject and the necessity of having some sort of guideline for estimating the amount of food a subject consumed.[436] Atwater expressed ambivalence about how his standard should be adjusted to account for gender, noting just that men were generally larger than women and "the bulkier the machinery in his organism," the more food a person would need. He added that the 0.8 ratio would be subject to revision when the evidence from calorimeter experiments on the food needs of women was better.[437]

Some scholars have argued that nutritional standards like Atwater's carried nutritional reductionism to the point where the distinctiveness of individual bodies was intentionally flattened

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[436] Elizabeth Neswald, "Nutritional Knowledge between the Lab and the Field: the search for Dietary Norms in the Late Nineteenth and Early Twentieth Centuries." Elizabeth Neswald, David F. Smith, and Ulrike Thoms, *Setting Nutritional Standards: Theory, Policies, Practices* (Rochester, NY: University of Rochester Press, 2017) 39.

[437] Atwater and Woods, *Dietary Studies in New York City in 1895 and 1896*, p. 6. Atwater, *Methods and Results,* p. 210.

to produce a single dietary standard that would fit everyone.[438] However, Atwater was well aware that his laborer who purchased 125 grams of protein daily was a fictional (though useful, he hoped) composite. Atwater's high dietary standard was a conscious decision to sacrifice specificity in the hopes of gaining clarity. Atwater's dietary standards were not intended as minimum rations or as upper limits for what a person should consume daily. Instead, he saw his dietary standard as a rough heuristic, reflecting the fact that an exact calculation of each person's dietary requirements could not be achieved. It was obvious to him that the vagaries of age, gender, occupation, and other conditions of living affected dietary requirements to a degree that rendered his calculations into a general guideline at best.[439] As he wrote to a colleague, "the dietary standards are only a sort of lump averages and I fear that I have not insisted strongly enough that the standard of 125 grams [of protein] and 3,500 calories of energy is for a man doing a good amount of muscular work."[440] Further, Atwater's standards for protein and energy were artificially high to accommodate the inefficiencies of American food preparation and dining habits, as revealed by his dietary studies. The inflated number served as a guide for how much food should be purchased daily, based on the likelihood that rather less than 125 grams of protein would actually be eaten and assimilated, given the fairly large amount of food wasted by the average American household, as uncovered by the dietary studies. "If nutrition could be governed by exact and scientific rules, under uniform conditions, all these standards could be much reduced, but such conditions are not to be expected," Atwater wrote.[441]

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[438] Mudry, *Measured Meals: Nutrition in America*; Gyorgy Scrinis, *Nutritionism: The Science and Politics of Dietary Advice*, Arts and Traditions of the Table: Perspectives on Culinary History (New York: Columbia University Press, 2013), http://web.b.ebscohost.com.proxy.uchicago.edu/ehost/ebookviewer/ebook/ZTAwMHhuYV9fNjE5NzA4X19BTg2?sid=1615af06-f19d-4a23-9afd-b06e55a2a41d@sessionmgr106&vid=0&format=EK&rid=1.

[439] Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food*, 9.

[440] Atwater to Edward Atkinson, January 22, 1895, Atwater Papers, Cornell.

[441] "Note to Prof. Atwater's Standard" Undated memorandum, (perhaps January, 1895?) Atwater Papers, Cornell.

Measuring the Representative Food of Representative People

In contrast to calorimeter studies, which examined the metabolic input and output of a single individual, dietary studies emerged as a way to measure the "input" into the metabolic economy of a group of people and to judge whether the food supplied was sufficient for supporting life and work. They helped researchers understand the conditions under which people prepared and ate their food, as well as how diet affected health and labor over a longer period. One of the first dietary studies was conducted by Justus von Liebig in the 1840s, in which he studied the dietary intake of over 800 Hessian troops.. Liebig weighed the total quantity of food served to these soldiers and estimated the nutritional content of the foods they bought for themselves; he then analyzed the chemical constituents of both the food and the soldiers' excrement, and used these results to calculate their average nutritional intake.[442]

Dietary studies were also deployed to investigate social conditions in the latter half of he nineteenth century. For example, the physician Edward Smith was commissioned by the British government in 1863 to study the diets of the working classes in Britain in the wake of the 1861-1865 Lancashire cotton famine. The famine had been brought on by the end of American cotton imports during the US Civil War, causing mills to close and workers to lose their livelihood. In his study, Smith set out to find the minimum cost at which the unemployed cotton worker could afford to buy enough food to avoid starvation, and the most nutritious diet that could be bought for this minimum allowance.[443] Similar work to Smith's on the working poor had been undertaken in Europe

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[442] Ulrike Thoms, "Setting Standards: The Soldier's Food in Germany, 1850-1960" in Neswald, Smith, and Thoms, *Setting Nutritional Standards: Theory, Policies, Practices*, 97–118.

[443] Theodore Cardwell Baker, *The Dietary Surveys of Dr. Edward Smith, 1862-3: A New Assessment*, Occasional Paper, no. 1 (London: Staples Press on behalf of Dept. of Nutrition, Queen Elizabeth College, University of London, 1970); Ian Miller, "Feeding in the Workhouse: The Institutional and Ideological Functions of Food in Britain, Ca. 1834–70,"

in subsequent decades. By the time that Atwater conducted his own dietary studies in the United States in the mid-1890s, he had collected the reports of almost 500 dietary studies which had been undertaken in Europe, primarily through personal visits to researchers on his travels abroad.[444]

As noted previously, the "laboring man at moderate work" was the representative subject of nineteenth-century nutrition research, and his dietary needs were the basis for nutrition standards created by Atwater and others. However, the representative subject for the USDA dietary studies was not a laborer: he was a white-collar professional, a choice that reflected Atwater's beliefs about the salutary habits of the middle classes as much as it did the practical limitations of access that structured his surveys. For example, college students were common subjects in these dietary studies, because students often took all their meals at eating clubs, where it was simpler to conduct a dietary study than in a private home. The ease of access to college students meant that college rowers or football players often stood in place of manual laborers in surveys of the dietary habits of "laborers." These "laborers" were really at leisure and enjoyed the best and most ample food recorded in the studies.[445]

Likewise, the "representative localities" chosen for Atwater's dietary studies were intended to stand in for specific regions: the dietary patterns of Lafayette, Indiana were to speak for those of the Midwest at large, Columbia, Missouri for the South, and Orono, Maine for the Northeast. However, these representative localities were often chosen because they were university towns or ones that

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Journal of British Studies 52, no. 04 (October 2013): 940–62, doi:10.1017/jbr.2013.176; Ian Miller, "Food, Medicine and Institutional Life in the British Isles, C. 1790-1900," in *The Routledge History of Food*, ed. Carol Helstosky (Routledge, 2014), 200–220; Valerie J. Johnston, *Diet in Workhouses and Prisons, 1835-1895*, British Economic History (New York: Garland, 1985).

[444] Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food*, 142.

[445] W.O. Atwater, *Dietary Studies of University Boat Crews* (Washington DC: Government Printing Office, 1900); W. O. Atwater and F. G. Benedict, "A Study of the Food Consumed and Digested by Four Members of the Harvard University Boat Crew in June, 1900," *The Boston Medical and Surgical Journal* 144, no. 25 (1901): 601–6, doi:10.1056/NEJM190106201442501.

housed experiment stations, picked for the convenience of their location near a university that had both competent investigators and appropriate laboratory space for performing chemical analyses of food samples. The college students who served as subjects were themselves regionally diverse, as they came from both urban and rural populations, allowing the studies to gain insights into the habits of city and country folk.[446] It is quite possible, however, that these locations had more in common with one another than they had with the regions they were intended to represent. While the choice of a professional man as the representative figure in the dietary studies was not explicitly spelled out or explained by Atwater in his writings or published works, it can be inferred from the fact that most of the subjects in the dietary studies were professionals of some ilk. The notion that the diet of a professional man or college student ought to stand in as the representative for all classes of Americans likely stemmed from Atwater's belief that Americans were some of the best fed people in the world, and that therefore the alimentary habits of the middle classes exemplified both moderation and sensible liberality in diet.

One can see Atwater's assumptions about the alimentary prudence of the American middle classes at work in the dietary study conducted in New York City in 1895-6. Alongside the poor, the researchers examined the food of a group of four settlement workers living in a mission house. It is likely the house was the Catherine Mission on the Lower East Side, as the family consisted of two women—probably Atwater's friend Isabelle Delaney and her sister—plus a female servant and a male friend who ate dinners and supper with the family. The household made no attempt to live economically, the study noted, as their work among the poor was arduous and they wanted to have their table be "as attractive and good as practicable without being extravagant." The women were "large, active people" who needed as much food as the average man, and so they ate a diet that

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[446] Ibid.

furnished 114 grams of protein and 3,780 calories daily, a diet that was deemed not excessive by the study authors, even though it furnished slightly more nutriment than was physiologically required.[447]

By contrast, Atwater and his colleagues disregarded income and costs of living as factors in the economy of a household, which caused them to attribute poor nutritional status to faults in education and training, rather than to socioeconomic causes. The urban poor were studied in New York and Chicago, and the rural poor were studied in New Mexico, the Tuskegee Institute in Alabama, and the Hampton Normal Institute in eastern Virginia. Unlike the groups of middle-class professionals and laborers, who were identified only by their professions, the poor were classed by their ethnicity or nation of origin to further mark their difference. Curiously, the poor populations included in the study were all immigrants or people of color rather than native-born whites. The decision to avoid studying white poverty led to odd substitutions; for example, college students in Missouri stood in for Southern white people of all income levels. Due to the omission of socioeconomic concerns from the studies, the reports about them contain a striking amount of condescension. Atwater and his co-authors saw people who were either educated people capable of maintaining a lifestyle comparable to that of the professional classes, or uneducated people who lived in squalor and ate bad food. Likewise, the researchers studying the urban poor had no qualms about calling some families "shiftless and careless" for spending too much of their limited budget on luxuries like fruit and vegetables and nice cuts of meat. Atwater and Woods even went so far as to criticize the home of one New York City family, where a 12-year-old girl had the responsibility of buying food and managing the household after her mother had died, calling it poorly run.[448]

On the one hand, moralizing about the lives and habits of the poor was not out of step with the rest of the social survey work in the 1890s, nor was it all that uncommon in the broader

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[447] Atwater and Woods, *Dietary Studies in New York City in 1895 and 1896*, 62.

[448] Atwater and Charles Woods, *Dietary Studies in New York City in 1895 and 1896*.

discourse on poverty in the period. The justification given in the dietary studies project for heightened scrutiny of people with limited means was that the professional classes could afford some waste in purchasing food, but the poor could not, and therefore they needed to be better at "marketing," cooking, and reducing food waste. Only rarely did the researchers conclude that a poor diet was due to poverty rather than to imprudence. In the researchers' eyes, families who had not been educated by agricultural schools or settlement houses were simply ignorant of the facts of how to manage a household and cook nutritious food economically. For example, the study of African-Americans living in Eastern Virginia contained a sketch of one well-off black family, headed by a bookkeeper. The authors noted with approval that the family's house was large and tidy and the food was healthy and frugal. Researchers attributed their lifestyle to the fact that they had been educated at the Hampton Institute, a historically black college in the region, not to the possibility that the family may have enjoyed a better income than their neighbors.

Taken as a whole, however, the dietary studies found that Americans' dietary habits adhered fairly closely to Atwater's standard of 3,000 calories and 125 grams of protein; this was in part because Atwater had adjusted his recommended intakes upward to match the actual food intakes found in his first studies.[449] On average, Americans of all classes ate about 3,300 calories per day, with 104 grams of protein, 122 grams of fat and 428 grams of carbohydrates. Laborers with a comfortable income ate roughly the same amount of food each day as professional men, but with about 30 more grams of fat, owing to a larger use of butter, lard, and bacon. The poor ate a similar amount of calories, though less protein and fat and far more carbohydrates than professional classes and laborers. Rates of food insecurity were highest among poor African Americans, who ate less protein and less food overall, totaling about half the amount of protein that what the broad mass of Americans ate.

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[449] Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition*, 106.

Atwater hoped that this work would help him make a broader point about how people's living conditions could be improved. He thought that, because workers in the United States were paid more, they had a better diet than their counterparts across the Atlantic, and for the most part European dietary studies bore this out. For example, a dietary study done on textile weavers in Saxony in 1885 showed that they spent most of their income on their food, which consisted primarily of bread, potatoes, herring, milk, butter, vegetables, and meat once a week.[450] The author of this study noted that while the people said they had enough to eat, they were not in good physical condition. Likewise, another study of the poor in Naples showed a fairly meager diet. Only the organ meats were cheap enough for the poor of Naples to eat; eggs and milk were far too expensive to be eaten at all, and bread, potatoes, and beans were often enough the only food.[451] But those were cases of particularly impoverished populations. Even excluding such groups of people who were actually starving, Europeans of all classes tended to eat less than Americans. Both the protein and the energy content of American diets exceeded those of Europeans by 50 percent. Atwater's confidence about the superiority of the American diet was reflected by other researchers who examined comparative diets and productivity. The general sense from both American and European social science researchers was that the liberal diets of Americans led to a higher rate of productivity.[452]

At the same time, Atwater wondered if greater temperance in eating might be advisable for Americans, particularly for those who did not engage in hard labor. In a throwback to Luther Bell's contention in 1835 that Americans were noted for their gluttony—a precursor to twentieth-century

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[450] Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food*, 163.

[451] *Ibid.* 173. Though Atwater did not provide an exact citation, this study may have been Luigi Manfredi, *Sull'alimentazione delle Classi Povere del Popolo di Napoli*, Roma, 1893.

[452] E. R. L. (Elgin Ralston Lovell) Gould, *The Social Condition of Labor* (Baltimore : Johns Hopkins Press, 1893), 189; Nitti, "The Food and Labour-Power of Nations."

laments about the excesses of the standard American diet—Atwater noted that the data suggested that Americans ate meat and sugary foods in excess, and the problem was particularly prevalent among people with sedentary habits. The magnitude of the American diet as ascertained through the dietary studies project was therefore a cause for some concern about Americans' health, suggesting that Americans might eat far too much. These questions remained rhetorical, as the data was not yet complete. However, the preliminary results from the dietary studies project, combined with anecdotal evidence Atwater heard from physicians about the health of their patients, suggested that overeating was widespread and potentially deleterious to health. This was, however, a medical problem that concerned individuals, not one bearing on national well being, and so it lay outside the purview of nutrition's social mission as he saw it.

Dietary Studies and the Social Survey

In an 1894 letter to the social reformers Woods and Cutting, Atwater mused on the ethos he thought the researchers working for his dietary study should embody. Entering people's houses to measure their food would be sensitive work, Atwater wrote, requiring its researchers to possess a great deal of tact and understanding. "Let the observations be made and the data collected by a person or persons with proper training, appreciation of the full import of the inquiry, and real sympathy with the people," Atwater told the two men. The investigator should "make his studies from their point of view as one with them, if not one of them. His method must be scientific but his spirit must be sympathetic."[453] The notion of sympathy as the animating spirit of his dietary studies sets Atwater a pace or two apart from his scientific colleagues, and evinces his close relationship and intellectual debt to his social scientist colleagues at the turn of the century. During

[453] Atwater, Memorandum on Food Studies, March 16, 1894. Atwater Papers, Cornell.

this period, reformers and sociologists became interested in administering social surveys to document all facets of working class life in the UK and US, including work conditions, religious observance, housing, and family life. As the historian of science Thomas Stapleford notes, it was a tenet of late nineteenth-century thought that ignorance was the root cause of the social crisis: experts, the broader public, and the working class themselves did not know the true facts of the working and poor class's situation. The production of social facts and their analysis would provide a rational basis for making collective decisions about how social questions ought to be solved.[454]

The dietary studies project was instigated through Atwater's networks of reformers, who in 1893-4 had begun to ask Atwater what he knew about food consumption among the broader population, and the poor in particular. He had fielded requests from parishes, college settlements, university extension schools, charitable organizations like the New York Association for the Improvement of the Poor, and even from individuals with specific questions about their diets.[455] The NYAICP was in fact one of the initial funders. The group had a longstanding interest in popular nutrition, having collected information about institutional dietaries in the 1850s.[456] Atwater told his assistant Charles Woods that the NYAICP wanted to know more about the living conditions of some of the families it helped with charity, and that they were willing to offer some money to help with the work.[457] Federal support, from the USDA and the Bureau of Labor Statistics, came about after the initial money from the NYAICP. Atwater was having a difficult time keeping up with these

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[454] Thomas Stapleford, *The Cost of Living in America: A Political History of Economic Statistics 1880-2000* (New York: Cambridge University Press, 2009), 26–27.

[455] For example, an Italian man living in Alabama wrote Atwater to ask him about how Italians could grow and make their own flour, in order to bake better bread and thereby improve the nutritional status of Italian immigrants in the US Alexander Mastro-Valerio to Atwater, August 5, 1896, Box 4, Uncatalogued Atwater Papers, Wesleyan.

[456] Atwater to Wright, March 8, 1894. Atwater Papers, Cornell. Robert Hartley of the NYAICP undertook a small study of the dietaries in institutions; see chapter 2.

[457] Atwater to Charles Woods, February 24, 1894. Atwater Papers, Cornell.

demands. As he wrote to A.C. True of the USDA, "some people here in town are getting interested in the subject, and, remembering that charity begins at home, I am trying to see what can be done right here."[458] Atwater believed that these requests for information were indicative of a broader need for more comprehensive information about food consumption in America.

Wright, at the Bureau of Labor Statistics, enfolded the dietary studies project into the Bureau's larger inquiry into wages and industrial production. He had wanted this new work to be an exacting and lengthy investigation, but he had been forced to take a more piecemeal approach, as the bureau's funding from Congress was not sufficient to put into place regular data collection protocols for wages, working hours, and prices.[459] Therefore, Wright funded a number of special projects; the food studies sat alongside work on alcohol and drinking, industrial education, social surveys of urban populations, and compilations of foreign and state labor statistics.[460] Wright had commissioned Atwater to conduct a small dietary study in 1884 through the Massachusetts Bureau of Labor Statistics, and this work served as a model for the 1890s studies.[461] The USDA was the institutional home for the dietary studies project, and Atwater leveraged the national network of experiment stations to provide bases for his investigations and its publishing arm to produce bulletins and reports.

Social survey work in the United States was modeled off of Charles Booth's studies of the working class in London .[462] This work, *Life and Labour of the People of London,* appeared in 17

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458 Atwater to A.C. True, January 11, 1894 and February 3, 1894. Atwater to Walter Page, March 22, 1894, Atwater Papers, Cornell.

459 Atwater to H.B. Gibson, June 22, 1892, Atwater Papers, Cornell.

460 Stapleford, *The Cost of Living in America: A Political History of Economic Statistics 1880-2000*, 30, 39.

461 Carroll Davidson Wright, *Food Consumption: Quantities, Costs, and Nutrients of Food-Materials* (Boston: Wright & Potter Print. Co., state printers, 1886).

462 Bradley W. Bateman, "Make a Righteous Number: Social Surveys, the Men and Religion Forward Movement, and Quantification in American Economics," *History of Political Economy* 33, no. Suppl 1 (January 1, 2001): 57–85, doi:10.1215/00182702-33-Suppl_1-57.

volumes between 1889 and 1903. It was intended to be a comprehensive project, detailing the range of paid work, working and living conditions, and the religious practices of as large a group of Londoners as possible.[463] What made the work new was its comprehensive interviews of all the participants, from factory owners to trade unionists, and its focus on the geography of poverty, including maps which showed concentrations of abject poverty among the city's neighborhoods.

The American followers of Booth took the approach of living near their subjects in settlement houses and conducting much of the analysis directly, rather than relying on visitors. *Hull-House Maps and Papers* (1895), published by the economist Richard Ely in his series *Library of Economics and Politics*, was one such direct descendant of Booth's *Life and Labour*. Led by Hull-House resident and researcher Francis Kelley and sponsored by Wright at the Bureau of Labor, the survey was conducted over the summer in 1893. Survey takers from Hull-House and the Bureau of Labor walked the streets of Chicago and visited homes and workplaces to ask people about their lives, work, and wages. The data was presented in a series of essays about the different ethnic groups of the city, as well as through a series of visually arresting maps of working class neighborhoods that took Booth's maps as their inspiration.[464] Likewise, Robert Woods's *The City Wilderness* (1898) was a collection of maps and essays about the working class and immigrants of Boston, and W.E.B. Du Bois's *The Philadelphia Negro* (1899) was a similar investigation of Philadelphia's African-American community.[465] Social survey workers also had a shared set of questions and methods of presentation

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[463] Thomas R. C. Gibson-Brydon, *Moral Mapping of Victorian and Edwardian London: Charles Booth, Christian Charity, and the Poor-but-Respectable*, (McGill-Queen's University Press, 2016), http://www.jstor.org.ezproxy.library.wisc.edu/stable/j.ctt1c6v9c5; Bulmer, Bales, and Sklar, *The Social Survey in Historical Perspective*, 20–21.

[464] Residents of Hull-House, *Hull-House Maps and Papers: A Presentation of Nationalities and Wages in a Congested District of Chicago, Together with Comments and Essays on Problems Growing out of the Social Conditions* (New York: Thomas V. Crowell & Co., 1895), http://archive.org/details/hullhousemapspap00unse.

[465] Robert Archey Woods, *The City Wilderness; a Settlement Study* (Boston: Houghton Mifflin, 1898); W. E. B. (William Edward Burghardt) Du Bois and Isabel Eaton, *The Philadelphia Negro; a Social Study* (Philadelphia, Published for the University, 1899), http://archive.org/details/philadelphianegr00dubo.

that bound their work together.. They all contained detailed descriptions of people's homes and workplaces and maps on the model of Booth's *Life and Labour,* and were well-larded with judgement-laden assessments about their subjects' lives and choices. In keeping with the mission of the settlement houses which were their incubators, the intention was both to document the conditions of people's lives and also to suggest avenues for both political and individual reform.

The USDA dietary studies project was a sibling of the social surveys. Atwater considered this to be the case, and his observations of the dietary habits of Americans were intended to supplement the social survey data. The value of the dietary surveys project was "greatly increased by collateral observations regarding occupation, wages, housing, education, health, physical and intellectual productive capacity, and the like," he wrote to a colleague in 1904."[466] The links between the dietary study project and the social surveys was reinforced through Atwater's personal connections to the intellectual networks being created at the settlement houses and in reform circles, and he leveraged these connections to find institutional partners for his project. Atwater was on friendly terms with Addams, as noted in the previous chapter, and the Chicago dietary studies were based out of Hull-House.[467] Atwater also cultivated ties with Booker T. Washington, inviting him to address a Wesleyan University student club on "the race problem in the South" in 1895. While Washington was in Middletown he was a guest at Atwater's home, where the two men planned the dietary studies that took place at the Tuskegee Institute later that year.[468] On the level of the reports themselves there are similarities between social surveys and the USDA dietary studies project. The tables of family expenditures on food in Booth's *Life and Labour* are just like those in the USDA studies. In addition, each report was not only a compendium of data about the nutritional content

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[466] Atwater to Charles D. Walcott, October 24, 1904, Carnegie Institution.

[467] Wilbur Olin Atwater et al., *Dietary Studies in Chicago in 1895 and 1896: Conducted with the Cooperation of Jane Addams and Caroline L. Hunt, of Hull House* (US Government Printing Office, 1898).

[468] Atwater to Booker T. Washington, March 5, 1895. Atwater Papers, Cornell.

of foods but also a rich source of detail about the lives and habits of their subjects, detailing their professions and physical activity, the number of people in their families, the condition of their houses, and their methods of preparing and serving food.[469]

The social surveys and their homes in the settlement houses thus served as a model, inspiration, and facilitator for the USDA dietary studies project. In return, the social survey authors drew on data from the dietary studies project to develop their own assessments the nutritional status of the working class and its relationship with the people's health and productivity. It was a fruitful exchange, because none of the social surveys had dealt with food and diet with the same level of detail and quantitative accuracy that the USDA dietary studies could provide. For his part, Charles Booth thought that the dietary studies were very useful for showing with exactitude the connections among wages, food prices, and health.[470] In *The Philadelphia Negro,* Du Bois referenced Atwater and Woods's study of the diets of the New York City poor, noting that just like their white counterparts in New York, the African-American population of Philadelphia prepared their food poorly and did not eat economically.[471] More directly, Atwater worked with the British Quaker philanthropist Seebohm Rowntree, who wrote *Poverty, a Study of Town Life* (1902) about the workers in the city of York.[472] Rowntree's work was particularly gratifying to Atwater, as it showed the close relationship between diet and human flourishing that was the animating spirit of his scientific work. Rowntree used Atwater's dietary standard for men doing moderate muscular work (3500 calories and 125

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[469] The dietary studies' wealth of detail about people's lives have made them useful sources for social historians. See, e.g., Robert Dirks, *Food in the Gilded Age: What Ordinary Americans Ate* (Rowman & Littlefield, 2016); Hasia R. Diner, *Hungering for America Italian, Irish, and Jewish Foodways in the Age of Migration* (Cambridge, Mass.: Harvard University Press, 2001), http://pi.lib.uchicago.edu/1001/cat/bib/9261629.

[470] Atwater, "Respiration Calorimeter," speech before the British Association for the Advancement of Science, August 24, 1904, Box 10, Uncatalogued Atwater Papers, Wesleyan.

[471] Du Bois and Eaton, *The Philadelphia Negro; a Social Study*, 161.

[472] Wesleyan *Argus* March 7, 1904. Box 10, Uncatalogued Atwater Papers, Wesleyan.

grams of protein) to set a nutritional benchmark for the working class of his city. The families Rowntree studied had diets that were 23 percent below the Atwater standard, less even than comparable working class families in Chicago, Philadelphia, and New York City; the average deficiency in protein was 29 percent, and wages were so low that even the strictest household economy would not help them improve their nutritional status. Rowntree noted that researchers in England commonly used Voit's lower dietary standard, which mandated 118 grams of daily protein, rather than Atwater's 125. In his book, Rowntree used Atwater's own words to help him argue for the higher standard in analyzing working-class diets:, he cited Atwater's remark that his protein standard was intended "to make the most of a man" rather than to keep him at a minimum level of subsistence.[473] Atwater's collaboration with Rowntree and other workers in sociology helped substantiate the contention that a high level of nutrition—particularly in the form of protein—was an essential part of a thriving people and a productive society.

International Collaboration

By the first years of the twentieth century, research on the relation of [people's] nutrition to their productivity and welfare was underway but needed additional work to reach Atwater's goal for this relationship to become a fundamental fact of human existence.[474] The dietary studies project and Atwater's metabolism experiments had provided preliminary facts about food use and need in the United States, and Atwater was ready to move on to a new phase of research, one that would leverage the rising international profile of his work in order to bring nutrition scientists in Europe and Asia into agreement about the best methods and approaches for science, and to make this

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[473] Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food*, 211; Quoted in B. Seebohm (Benjamin Seebohm) Rowntree, *Poverty; a Study of Town Life*, 2nd ed. (New York, H. Fertig, 1902), 91, http://archive.org/details/povertyastudyto01rowngoog.

[474] Atwater, "Memorandum Regarding Measures for International Cooperation in Nutrition Investigations," June 19, 1904, Box 10, Uncatalogued Atwater Papers, Wesleyan.

research more widely available. Atwater was convinced that international collaboration was essential for nutrition scientists: it would help researchers uncover the role of diet in ensuring "the health and strength of people of all classes."[475] By collating dietary data from around the globe one could see where improvements in national diets could be made; international collaboration would also provide an opportunity to standardize laboratory and study methods, ensuring a uniform quality of data that could be disseminated widely and made available to physicians, economists, and anyone else interested in the relationship between food use and productive power. [476]

This new phase of research saw Atwater organizing on a bigger level than in previous years, though using some of the same tools he relied on in the past: obtaining both state and nonprofit buy-in and getting them to fund his work, and coordinating the efforts of scientists to work on projects of common purpose. Atwater had travelled extensively in the last years of the nineteenth century, showing up in European laboratories from Brussels to Budapest and canvassing researchers' willingness to share their work. Likewise his own laboratory hosted foreign researchers from even further afield who became collaborators, like Kintaro Oshima of the Imperial College in Sapporo, Japan, who visited Middletown to study calorimetry in 1898. Oshima would later publish a USDA bulletin about Japanese food materials, using Atwater's standard methods for analysis.[477] His assiduous forging of connections among researchers was intended to provide the grounds for setting up formal networks of exchange, both through international scientific conferences and through diplomatic channels. In 1904, Atwater planned to have a meeting of nutrition researchers at

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[475] Atwater, "Report of Progress in Securing Foreign Cooperation in and Aid of Nutrition Investigations," June 1, 1904. Box 10, Uncatalogued Atwater Papers, Wesleyan.

[476] Atwater to Walcott, October 24, 1904. Carnegie Institution.

[477] Kintaro Oshima, *A Digest of Japanese Investigations on the Nutrition of Man*, Experiment Station Bulletin 159, 1905, https://search.library.wisc.edu/catalog/9910048961902121.

both the Scientific Congress at St. Louis and the International Physiological Congress in Brussels.[478] The meetings would allow researchers to agree on standard methods of collating and exchanging the results of nutrition investigations, as well as to unify experimental methods to make results more comparable. On the diplomatic front, Atwater lobbied the Secretary of Agriculture in 1904 to ask the US State Department to set up a formal means for exchanging government-funded nutrition research with the German foreign ministry.[479] He had also received a request from the French Society for Alimentary Hygiene and the Nutrition of Man for him to ask the American Secretary of Agriculture to encourage his French counterpart to fund nutrition research, as this request would materially help us in our efforts to secure government appropriations and private gifts."[480] The society took Atwater's research to be a model for their own work on rational nutrition, particularly Atwater's successes in having it funded by the state.[481]

By the early years of the twentieth century Atwater was beginning to move away from his associations with both the USDA and Wesleyan University. Atwater's relationship with Wesleyan was not always friendly, due to the fact that he had an independent funding stream and worked largely out of the college's control. In the 1870s and 80s, Wesleyan President John Beach contended that Atwater was draining college resources through salaries for assistants and maintenance expenses for his laboratory, while not keeping up his educational responsibilities. Beach charged Atwater $500 a year as rent on his college building in retaliation.[482] Private institutions were starting to become a

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[478] Atwater, "Memorandum Regarding Measures for International Cooperation in Nutrition Investigations" June 19, 1904. Box 10, Uncatalogued Atwater Papers, Wesleyan.

[479] "Note regarding proposed letter to the Secretary of State" Box 10, Uncatalogued Atwater Papers, Wesleyan.

[480] "Details. Measures in Different Countries." Box 10, Uncatalogued Atwater Papers, Wesleyan.

[481] Translation of L. Grandeau, "Agricultural Review" *Le Temps* May 7, 1904, Box 10, Uncatalogued Atwater Papers, Wesleyan.

[482] Peterson, *The New England College in the Age of the University*, 115–16.

force in scientific institution building and agenda setting, and Atwater was characteristically right on the curve of this development: the Carnegie Institution had officially opened in January 1902, and Atwater was the institution's fifth ever grant recipient, for developing a means to measure the oxygen consumed by a subject using the respiration calorimeter. Adding this capacity to the apparatus would allow Atwater to better measure the energy expended and materials exchanged when the body performs muscular work.[483] Atwater needed Carnegie to directly fund laboratory work, as most of the appropriations from Congress—which had reached $20,000 per annum by 1902—was being used for the dietary studies.[484]

Atwater had big plans for Carnegie's involvement in nutrition science. In October 1904, weeks before his stroke, Atwater had indicated to officials there that he would be willing to leave Wesleyan and stop work with the USDA if they would organize and fund a department that would lead nutrition research and coordinate the activities of other research institutions, with Atwater at the helm.[485] This central establishment would put particular stress on the relationship of food to productive power, as well as comparative nutrition in its relations to human welfare and character. Atwater proposed that the lab would investigate four lines of inquiry: the general study of metabolism of matter and energy in the body, studies in the physiology and physiological chemistry of nutrition, feeding experiments with individuals or groups to test the effects of different diets under varying conditions, and more observational studies of the actual nutrition levels of people in different regions and under different conditions of life. He envisioned an annual funding stream of between $50,000 and $100,000.[486] The nutrition lab would also organize nutrition research on an

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[483] Abstract of Application, Grant #5; Atwater, "Memorandum to Accompany Application for Grant in Aid of Research" December 12, 1902; "Direct Determination of Oxygen in Metabolism Experiments" Undated document. Box 1, Folder 1, Carnegie Institution.

[484] Atwater, "The Demand for Special Investigations" Box 1, Folder 1, Carnegie Institution.

[485] Walcott to John Shaw Billings, October 24, 1904, Carnegie Institution.

[486] Atwater to Walcott, October 24, 1904, Carnegie Institution.

international level: it would promote a series of investigations on a common plan in different countries, and then collate results. The inquiry would center on studies of people's diets, but information about earnings, housing, clothing, and other conditions of living would also be collected. On a policy level, Atwater argued that the lab could act as a "stimulus" to spur researchers in the US and abroad to carry on this work, and to induce Congress to appropriate more funds for nutrition research.[487] As Atwater wrote to Carroll Wright, the USDA secretary who also served as a trustee of the Carnegie Institution, "with the closer relation between people of different countries, the clearer understanding of the fundamental laws of national and international economy, the broadening of sympathy and the growth of the altruistic spirit of our time, there is, I believe, an opportunity for successful development of the science of the comparative nutrition of mankind."[488] This proposal preceded Max Rubner's plan for a similar institute; his Kaiser Wilhelm Institute for Labor Physiology opened in 1913.

Atwater's plan for a Carnegie-funded nutrition institute came as other workers in nutrition were having similar ideas about the need to collaborate internationally. In 1901, the American diet faddist Horace Fletcher proposed to create an international institute for nutrition research, funded by Fletcher's wealthy older brother and staffed by scientific luminaries such as the British physiologist Michael Foster, the biochemist Frederick Gowland Hopkins, and the physiologist Ivan Pavlov. Fletcher was known for his theory that thorough mastication (for substantially longer than the customary length of time) was the healthiest way to ingest food: he contended that such vigorous chewing would reduce the intake of protein and calories to just the amount the body needed as well as heal chronic health problems. The fact that Fletcher was in a position to propose a

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[487] Atwater to Billings, August 8 1902, Carnegie Institution.

[488] Atwater to Wright, August 8, 1902, Carnegie Institution.

new nutrition institute was a less surprising idea than it might appear at the outset, as he had courted the interest of scientists in the US and Britain, knowing that scientific support would be essential for the success of his theories. While Atwater was not a supporter, British scientists, like Foster and Hopkins, started to test Fletcher's ideas and became enthusiastic chewers themselves. However, Fletcher's institute never came to pass; his older brother was not interested in providing the money, and Fletcher's grant proposal to the Carnegie Institution was not funded.[489]

Unraveling Nutrition's Social Mission

By 1904, the elements of nutrition as a social question had fallen into place. The USDA dietary studies had established a baseline for understanding the country's food needs, and the results had been put into context with similar studies in Europe and Asia. The relationship between food and productive power had begun to be understood, by placing facts about food consumption alongside other sociological observations about wages, prices, and national productivity. Human metabolism studies were underway as well, useful for establishing people's physiological requirements. Further, the seeds for international collaboration had been planted, in the hope that reliable information about nutrition would be created and shared across the globe. Finally, as noted in the previous chapter, home economists were poised to disseminate scientific information about food and diet, armed with USDA bulletins that were filled with the basic facts of human nutrition. Despite having all of the elements in alignment, Atwater's push to answer the questions raised by his research foundered in the early twentieth century due to changing personal, scientific, and political circumstances.

[489] L. Margaret Barnett, "Fletcherism: The Chew-Chew Fad of the Edwardian Era" David Smith, *Nutrition in Britain: Science, Scientists and Politics in the Twentieth Century* (Routledge, 2013), 6–28.

The personal setback was the most definitive. Atwater passed away in 1907 after three years of being confined to his bed by a stroke, which had effectively taken him out of professional life in November 1904, at the height of his career. It is notable, however, that he had not established a deputy in his laboratory who was willing to carry on his mentor's agenda for nutrition research. Francis Gano Benedict, who had worked with Atwater on his calorimetry experiments in the late 1890s and was appointed a professor at Wesleyan after Atwater's stroke, took a dim view of Atwater's blending of science and reform, noting that Atwater had "mixed horribly his abstract science and his ethics."[490] In 1907 Benedict moved Atwater's old laboratory to the Carnegie Institution's new nutrition laboratory in Boston, though Atwater's calorimeter was sent to C.F. Langworthy's laboratory in the new USDA building in Washington.[491] Benedict's scientific agenda laid aside the question of social welfare and instead focused on metabolism research in the laboratory and its clinical applications, particularly in efforts to establish human metabolic norms. Benedict's vision for international collaboration, too, was strictly scientific: it was focused on standardizing methods and coordinating work in calorimetry experiments, not on socially engaged research.[492]

The ground shifted scientifically as well at the turn of the century though the 1920s, which recast the relationship between political economy and nutrition science. If the relationship between high productivity, a robust working class, and an abundance of meat was treated as established fact throughout the nineteenth century in the United States, France, and Germany, by 1900 this

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[490] Benedict's statement about Atwater was written in an autobiographical memoir written after Atwater's death. Pauly, "The Struggle for Ignorance about Alcohol: American Physiologists, Wilbur Olin Atwater, and the Woman's Christian Temperance Union."

[491] "Nutrition Work of the Carnegie Institution of Washington," *Journal of Home Economics*, 1, no. 5 (June 1909): 290-1.

[492] Elizabeth Neswald, "Strategies of International Community-Building in Early Twentieth-Century Metabolism Research: The Foreign Laboratory Visits of Francis Gano Benedict," *Historical Studies in the Natural Sciences* 43, no. 1 (February 1, 2013): 1–40, doi:10.1525/hsns.2013.43.1.1.

relationship had begun to fray.[493] The physiologist Russell Chittenden and others had successfully dismissed as unnecessary the high protein standard called for by Voit and Atwater, by experimentally demonstrating that people could thrive on a diet that contained far less protein than they considered appropriate.[494] Among Chittenden's research subjects was Fletcher, who in 1903 convinced Chittenden of the superiority of his lower protein and calorie diet.[495] In his 1904 book *Physiological Economy of Nutrition,* Chittenden published studies of soldiers, college athletes, and professional men, demonstrating that they could sustain vigorous muscular work and mental acuity on a protein level "equal to one-half or one-third, than ordinarily consumed by men of this stamp," rendering the high protein level in the average American diet physiologically unnecessary.[496] Chittenden further attacked the USDA dietary study project, arguing that observational studies of people's dietary habits were an inexact means for measuring their dietary needs, and questioning whether they "have any very important bearing" on the study of physiological requirements.[497] Reliable physiological knowledge could only come from long-term laboratory studies on individuals, he suggested, in which experimental subjects consume a controlled diet for several months at a time to determine the minimum amount of food their bodies required.[498]

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[493] Corinna Treitel, "How Vegetarians, Natropaths, Scientists, and Physicians Unmade the Protein Standard in Modern Germany," and Deborah Neill, "Of Carnivores and Conquerors: French Nutritional Debates in the Age of Empire" in Neswald, Smith, and Thoms, *Setting Nutritional Standards: Theory, Policies, Practices*, 52–73, 74–97.

[494] Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition*.

[495] Smith, *Nutrition in Britain*, 11.

[496] The lower protein level persisted through the twentieth and twenty-first centuries. USDA currently recommends 56 grams of protein per day for adult men, and 46 grams for women. "2015-2020 Dietary Guidelines - Health.gov." Accessed March 20, 2017. https://health.gov/dietaryguidelines/2015/guidelines/.

[497] Russell Henry Chittenden, *Physiological Economy in Nutrition: With Special Reference to the Minimal Proteid Requirement of the Healthy Man* (Stokes, 1904), 3.

[498] Neswald, Smith, and Thoms, *Setting Nutritional Standards: Theory, Policies, Practices*, 39.

Atwater's possible response to Chittenden can be surmised from his extant writings on the protein minimum, his social views, and perhaps by the response written a few years later by Benedict. The historian of science Kenneth Carpenter notes that Atwater was aware that people could remain in nitrogen balance on a much lower quantity of protein per day, but speculated that there were other reasons why people wanted to eat large amounts of protein when undergoing strenuous muscular work; perhaps it reflected the requirements of the nervous system.[499]. Benedict, for his part, thought Chittenden's research proved that people can maintain their body weight and health on a small amount of protein, but that the Yale researcher had not proved that this low diet "could be most advantageously adopted for all time," Benedict wrote in 1906. Chittenden's work did not cause him to disagree with Atwater's notion that the most productive people eat considerable quantities of protein.[500] It was possible that Atwater and Chittenden would have come to some accord. Atwater had written in October 1904 that he thought feeding experiments similar to Chittenden's would be an important part of the Carnegie nutrition institute's work.[501] Carnegie Institution leaders seemed to agree; by November they were on the cusp of inducing Atwater and Chittenden to harmonize their approaches to the study of human diet. The physiologist Henry Pickering Bowditch wrote to John Shaw Billings, who served as the chair of the Carnegie Institution's board of directors. Bowditch suggested that Atwater and Chittenden ought to be put on a commission to create a plan of cooperative research. Nutrition research in the US would be improved if "we can persuade Atwater and Chittenden to work in harness," Bowditch wrote. The two had laboratories in Connecticut within easy commuting distance, and they "could, if they

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[499] Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition*, 106.

[500] Francis Gano Benedict, "The Nutritive Requirements of the Body," *The American Journal of Physiology* 16, no. 4 (August 1, 1906): 409–37.

[501] Atwater to Walcott, October 24, 1904, Carnegie Institution.

wished, work harmoniously for the advancement of American Science."[502] Such a plan was, of course, cut short by Atwater's stroke. By dismissing the protein standard and the observational studies that confirmed its importance, critics like Chittenden opened the question of whether poor families ought to spend so much money on protein, even if it came from cheaper sources like beans. For his part, Chittenden argued that the lower protein requirements indicated in his own research meant that families could safely reduce their meat consumption to the smallest physiological requirement, as "there is no reason why the family treasury should be so heavily drained for this imaginary need."[503]

The input-output model of metabolism, too, with its emphasis on the macronutrients which fueled life and labor in human bodies, came to face competition from other models for researching nutritional needs. It was replaced by a biochemical model that sought to understand metabolism at a cellular level and focused on the biological activity of small molecules, like vitamins. The shift was spurred by experimental work that demonstrated the nutritional value of small quantities of certain organic substances, as well as feeding trials on experimental animals that showed how diets of purified protein, carbohydrate, or fat were insufficient for maintaining health.[504] This indicated that there were "food factors" other than the macronutrients which were crucial for maintaining health, and that researchers had to examine metabolism on a lower level of organization than the human or mammal body to understand their function. This was a significant shift away from the input-output method employed by Atwater, which essentially saw the body as a black box; what was chiefly

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[502] Bowditch to Billings, November 3, 1904, Carnegie Institution.

[503] Chittenden, *Physiological Economy in Nutrition*, 454, 471.

[504] Carpenter, *The History of Scurvy and Vitamin C*; Frances Rachel. Frankenburg, *Vitamin Discoveries and Disasters: History, Science, and Controversies* (Santa Barbara, Calif.: Praeger/ABC-CLIO, 2009); Rima D. Apple, *Vitamania: Vitamins in American Culture* (New Brunswick, N.J.: Rutgers University Press, 1996).

relevant was the total income and output of matter, not the transformations it underwent.[505] The biochemists sought to peer within that box, and perhaps to leave behind the box entirely: there was no further need to know what kind of organism was being investigated. As the British biochemist Hopkins wrote, biochemistry could investigate metabolism in any living thing, from "its manifestation in a bacillus to its manifestation in man."[506] This shift toward more basic and biological research in nutrition science moved researchers' attention to laboratory work and away from studies of diet in the field.

Atwater's model of nutritional uplift, which centered on mass education about proper dietary habits, had begun to seem dusty and dated to biochemistry-oriented nutrition researchers by the first third of the twentieth century. The research school of Noel Paton, a Glaswegian colleague of Atwater's, came under criticism in the 1910s for his contention that undernutrition and deficiency diseases like rickets among Scotland's working classes were due to their own poor food selection and cooking, problems that could be remedied by education. By contrast, biochemists working on deficiency diseases charged that it was the vitamin-deficient character of cheap staple foods that was at issue; it was the quality, not the selection of the food that engendered disease. The debate tracked alongside Paton and his colleagues' contention that filth and poor living conditions were the cause of rickets, not the absence or presence of an anti-rachitic factor.[507] It is unclear whether Atwater would have amended his ideas about nutrition, which, like Paton's, was particularly focused on the food choices people made, in light of the advent of the vitamin theory. The resistance of his old colleague to new ideas raises the question of whether he would have faced difficulties making this shift.

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[505] Atwater, *Methods and Results of Investigations on the Chemistry and Economy of Food*, 101.

[506] David Smith and Malcolm Nicolson, "The 'Glasgow School' of Paton, Findlay and Cathcart: Conservative Thought in Chemical Physiology, Nutrition and Public Health," *Social Studies of Science* 19, no. 2 (1989): 195–238.

[507] Ibid.

Economics and the social sciences more broadly, too, ushered out moral concerns in the first two decades of the twentieth century in order to focus on exacting quantitative analysis, thereby moving the attention of Atwater's allies in the social sciences away from questions that linked their disciplines to ethical concerns. The Social Gospel movement also faded in importance by World War I. As the historian of religion Martin Marty has noted, Social Gospelers were not intellectually or politically equipped to know how to right an unjust class system or to break monopoly power, having focused so intently on moral exhortations over the amassing of political power.[508] Further, the Social Gospelers' sunny vision of progress toward the Kingdom of Heaven seemed to make little sense in light of the mass slaughter of World War I. The Social Gospel's central message was absorbed into mainline Protestant churches; during the war, the notion of America as the place where the Kingdom of Heaven could be built changed into a mix of nationalist ideology and anti-German propaganda.[509] With the diminishing of the Social Gospel movement, Atwater's closely held belief that better nutrition might help bring people to the Gospel would have lacked both the ideological and the institutional support it enjoyed in the 1890s.

The war, too, shifted the aims of nutrition science. International collaboration was cut short because of it, isolating German researchers from their peers overseas. The notion of food as a central guarantor of productive power was easily shifted to militarist or propagandistic ends. In addition, the necessity of wartime rationing in Europe and the United States yoked nutrition science to the maintenance of minimum rations designed to ensure the productivity of the worker and the soldier at minimum cost, a far cry from the more generous dietary standard that Atwater had outlined.[510] Further, during the war and its aftermath there was considerable interest US and Europe

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[508] Martin E. Marty, *Pilgrims in Their Own Land: 500 Years of Religion in America* (Boston and Toronto: Little, Brown and Company, 1984), 351.

[509] Bateman, "Clearing the Ground."

[510] Veit, *Modern Food, Moral Food*; Cullather, "The Foreign Policy of the Calorie."

in ensuring that the public food supply contained sufficient amounts of vitamins to prevent nutritional deficiency disorders like rickets and pellagra, shifting the focus of studies on the diet and health of populations from the relationship between work and productive power to vitamins and deficiency disorders.[511]

The broader aim of Atwater's scientific work was to use both observational studies of people's diet and physiological studies of their metabolism to design a diet that would ensure human flourishing, and then educate the public about how to make their own diets conform to this standard. The dietary studies project was a chief way for Atwater to collect social facts about people's diet and relate them to broader questions of people's standard of living, work that was in line with the social surveys of his sociologist and settlement worker colleagues. Finally, the last phase of the framing of nutrition as a social question was about to be realized in the form of Atwater's plan for a central institution for nutrition science, one that would harmonize efforts among researchers worldwide. Despite Atwater's assiduous gathering of all of the parts of nutrition as a social question, it may be that his particular answer for it would have lost its relevance by the early twentieth century. Atwater's project of creating a nutrition science that would uplift humanity by discovering and disseminating the fundamental facts of living would have made brought nutrition science to bear on finding the best diet for all, but it was not a project that came to fruition.

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[511] W. B. Gratzer, *Terrors of the Table: The Curious History of Nutrition* (Oxford: Oxford University Press, 2005), 3–11.

Conclusion: Nutrition and the Problem of Inequality

> Is it not possible that social organization, like [the bodily organization] of the lower animals, is still in a rudimentary stage of development? It would appear that civilized society has some of the requirements for achieving homeostasis, but that it lacks others, and because lacking them it suffers from serious and avoidable afflictions.

When the American physiologist Walter Bradford Cannon wrote these lines in an epilogue to his 1939 book *The Wisdom of the Body*, he was musing about the analogy between body and society and the possible implications of his own scientific work on this analogy. Cannon had coined the term "homeostasis" in 1926 to refer to the maintenance of steady states in the body and the physiological processes that regulate them. Building on Claude Bernard's concept of the *millieu intérieur*, Cannon noted that homeostasis was an essential feature of the bodily economy, as the organ systems made continual adjustments to perform the necessary functions which ensured the health and safety of the organism without the conscious input of the brain. If the lower brain did not make these adjustments, an organism would have to maintain constant vigilance over its own body in order to avoid disaster, and thus be unable to accomplish any other functions of normal life and activity. Cannon's observation that there was no analogous homeostatic system in the social body meant for him that individuals within that society had to struggle to obtain the necessities, like food, shelter, and medical care, without help from a central authority which could provide them automatically. Even so, he expected that a method for achieving a social homeostasis would evolve, just as bodily homeostasis did, and experts in politics, sociology, and economics were working toward that end. "There is a widespread search for the conditions which would diminish the

anxieties and distress which are caused by the great ups and downs of economic fluctuations," Cannon wrote. "Stability would free mankind from a vast amount of pain."[512]

The attempt to free both individual bodies and the society they lived in from dangerous instability was an animating idea behind the framing of nutrition as a social question. As noted at the outset of this work, nutrition as a social question was instigated in the 1830s as part of a naturalization of economic thought that saw nature as a system in balance. Opposing forces in a society, like the available agricultural resources and the number of mouths to feed, needed to remain in balance for society to attain harmony. Cannon's evocation of the social body as one in need of a mechanism for achieving homeostasis shows how the social organism analogy had shifted over the course of the nineteenth century. For one, it had gained in complexity; homeostasis involved keeping a number of different bodily processes constantly in check. Cannon's notion that modern society required a means for attaining homeostasis, rather than simple equilibrium, was a reflection of the diverse and complex reality of modern industrialized society. Among the experts arrayed to achieve homeostasis were the framers of nutrition as a social question, and they too saw their work as a way to care for the social body.

This dissertation analyzed the history of nutrition science in nineteenth-century America, by portraying its growth into a social question. Over the course of the nineteenth century, nutrition as a social question took shape armed with technocratic confidence and guided by metaphors that explicitly connected bodily fortitude with the strength of society. On a scientific level, the development of nutrition as a social question was dependent upon the intake-output model of metabolism, which saw the body as a machine for work. The body needed fuel, meat in particular, to ensure labor productivity and overall health and well being. On the level of social thought, the social

[512] "Relations of Biological and Social Homeostasis" Walter Bradford Cannon, *The Wisdom of the Body*, 2nd revised and enlarged (New York: W.W. Norton & Co, 1939), 305–24.

organism metaphor linked the bodies of the workers to the health of society in which they took part. If the framers of nutrition as a social question did not actually manage to achieve homeostasis with regard to popular diet, they did establish the framework could allow for such a notion to exist.

In the 1830s, nutrition as a social question centered on reinforcing what was already dietary common sense, on the assumption that free people were at liberty to choose their own diets, directed by proper guidance from authorities operating on accurate scientific and medical information. The New England worker was considered particularly able to manage his own diet, as he surpassed his fellows in Europe in health, strength, and appetite. This notion began to shift with the focus on people who might not be trusted in the same way. Social reformers in the country at midcentury tasked themselves with the job of managing complex cities with their prisons, alms houses, and newly arrived immigrant populations. The social valence of nutrition shifted accordingly, to become one where dietary common sense could not be always relied upon, and technocratic management was summoned to step into the breach. In prisons and alms houses, full of people made strange either by foreign birth or by their ostensible criminality, the dietary needed to strike a balance between prudent austerity and sufficiency for preserving health. By contrast, the Union Army soldier was the face of the country during the war, and while he must be fed to repletion his food needed to be both small in size and inexpensive in cost, to preserve the country's resources. The experiments of managing the dietaries of groups of people in institutions like prisons, alms houses, and armies prefigured attempts in the last two decades of the century to widen nutrition as a social question to involve all of society. The final formulation of nutrition as a social question became a search to find a dietary standard that would not only preserve people's health and strength, but also actively promote human flourishing, both nationally and internationally.

The development of nutrition as a social question in the United States was dependent on specific cultural and intellectual contexts, as the practice of nutrition science largely took place

outside of a central institution or laboratory, and lacked clear direction from the state. Understanding the lives of the people who imbued nutrition with broader meaning—their religious beliefs, political and social values, training and education, and friends and associates—is crucial for understanding the development of nutrition in nineteenth-century America. Common threads among these men were an interest in improvement, whether it be moral, social, technological, or a mix of all three; and a belief that their interventions would be the agent of this improvement. The framers of nutrition as a social question were involved in projects that intervened in the social and political life of their country: Whig politics, prison reform, temperance, the settlement movement and religious charities.

Running through all of these efforts was a focus on imbuing people's actions and consumption patterns with moral valence or social importance. Just as the framers of nutrition as a social question were not laissez-faire in politics, they did not think that everyone should eat without reference to rules. It mattered for the framers of nutrition as a social question whether a person chose to eat a vegetarian diet, had too much to eat in an almshouse, got a substantial portion of meat in the army, or spent too much money on expensive cuts of beef, to use examples from this dissertation. While the paternalistic intent of these interventions is clear, the framers of nutrition as a social question were often thwarted in their efforts to compel others to live by their ideas and thus improve their lives and their society. As their choices lay largely out of reformers' reach, the New England worker could eat what he liked, almshouse administrators could serve what they wanted, soldiers could throw away rations, and people could spend their money on any food that appealed. All the same, the framers of nutrition as a social question did not try to create a standard for diet that would maintain people at the minimum amount of food needed to support life, as some

scholars have argued; in general, nutrition in America focused on how to maintain what they thought to be Americans' high standard of living.[513]

The framers of nutrition as a social question largely avoided putting nutrition in the hands of the state. This is partly due to the weak American administrative state before the Civil War, but also reflects a belief common to many nineteenth-century reformers that voluntarism was the proper animating spirit for social change. This was in contrast to contemporaneous developments in Europe, particularly Germany, in which reformers like Max Rubner thought the state should take a more active role in policing the dietary habits of the people.[514] It was further in contrast to public health, which was just as interdisciplinary and reform-minded as nutrition, but required state intervention to achieve its goals. The framers of nutrition as a social question were interested in having the government adopt their ideas not out of a statist view that that was the proper role for the government, but out of an instrumental view that the federal government would have the money to provide support for their labors. Bell argued for state funding for mental institutions, but not for the governance of the diet of the working classes. Gould saw the government of his state of New York as far too corrupt to be involved in, though he knew the state needed help to wisely manage its funds for immigrant relief. Horsford was essentially an aspiring military contractor, one of many who buzzed around Washington during the Civil War hoping for a fat contract that might make them wealthy. Likewise, Atwater needed government funding in order to underwrite his scientific work and print the bulletins that would provide the basic facts about nutrition, but his partners in reform were voluntary philanthropic and religious organizations that he thought should take up the task of teaching people the best way to feed themselves.

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[513] Mudry, *Measured Meals: Nutrition in America*; Scrinis, *Nutritionism: The Science and Politics of Dietary Advice*; Cullather, "The Foreign Policy of the Calorie."

[514] Treitel, "Max Rubner and the Biopolitics of Rational Nutrition"; Treitel, "Food Science/Food Politics."

The distinctive features of American Protestantism in the nineteenth century that accounted for its strength as a cultural force made it a natural home for framing nutrition as a social question. Protestant churches were free, voluntary associations flourishing under the separation of church and state, and were further places where Protestant immigrants could find a sense of belonging and source of material support.[515] Moreover, religious thought was a seedbed for the social sciences more generally in the United States, and nutrition science, with its close links to the social sciences, was no exception. Dorothy Ross has suggested that religion began to separate from the social sciences after the Civil War due to American intellectuals' contact with positivist science. Ross has not argued that there was a clash or conflict between religion and science in the period, but that the "harmony" between science and religion was recast, with science setting the terms of it.[516] My work on nutrition as a social question suggests that religious explanations for phenomena certainly took a back seat to biological or social scientific ones, but that science served the religious aims of the men who framed nutrition as a social question. This is in part due to fact that the Protestant denominations of these men—Quakerism and Methodism in particular—emphasized religious observance as membership. Both denominations were cohesive church groups that monitored the behavior and beliefs of their adherents. It was not much of a pivot for Gould and Atwater to extend this ethos of care and paternalism to the rest of society, even though Atwater felt more of a need than the Quaker Gould did to keep his religious beliefs close to the vest so as not to ruffle the feathers of his secular scientific colleagues. Bell and Horsford, too, though they did not wear their religious beliefs on their sleeves, were also concerned with community; Bell wished to ensure that workers stayed within the fold of dietary good sense. Horsford, may have been motivated by profit,

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[515] David Hollinger, "Christianity and its American Fate: Where History Interrogates Secularization Theory" in Joel Isaac et al., *The Worlds of American Intellectual History* (Oxford University Press, 2016), 280–98.

[516] Ross, *The Origins of American Social Science*, 57.

but was earnest in his efforts to help the Union win the Civil War and to reunite a community riven over slavery.

Medicine, too, underwent a shift in its relation to nutrition. Medicine throughout the nineteenth century had served as a check on the excesses of nutrition scientists' ambitions, by reminding them that the health of the individual must be maintained when considering changes to a diet. This was particularly the case in terms of institutional dietaries, where reformers' zeal for cheap regimens was countered by some physicians' admonition that any new diet—at least on paper—ought to preserve the health of the individuals who would eat it. Over the course of the nineteenth century, a tension existed between the scientists' push to ground nutrition in physiological and chemical facts about the human body, and physicians' traditional instance that knowledge gleaned from a patients' body at the bedside superseded theoretical or scientific knowledge. This tension had largely relaxed by the end of century, eased by medical reformers' efforts to ground medicine in basic science and thereby give both physicians and scientists a similar worldview, so that the authority of medicine was rooted in scientific research and the chemical and physiological language that structured the discourse of nutrition was unthreatening to doctors.

Despite the backing of the physicians, the support of the churches, and some support from the federal government, the push to provide a dietary standard that would promote human flourishing foundered on technical and ideological grounds. On the most basic level, reformers were bested by the technical complexity of finding an accurate dietary standard that could suit everyone. On the level of ideas, the nationalist ideology of American exceptionalism that guided the framers of nutrition as a social question was a further cause for confusion. On the one hand, it directed them to set their dietary standards high; if the American worker was unique in his strength and productive capacities, he ought to have the best diet among the workers of the world. On the other hand, American nationalism cultivated an ungrounded belief about American superiority in terms of

diet and strength that blinded them to actual problems of malnutrition. It was clear to the men who framed nutrition as a social question that the farmer and prosperous mechanic of antebellum America were the best fed in the world; the Union Army during the Civil War was the best fed in the world; and even after industrialization the worker still enjoyed a higher standard of living than his counterparts abroad. Even (and perhaps especially) when that claim proved to be factually true, it deflected researchers' attention from seeing the hunger in their midst, and instead they saw only problems of imprudence and poor household management. This nationalist ideology of nutrition persisted despite the evidence that many Americans suffered hunger and malnutrition: prisoners were abused, soldiers went hungry, and workers were paid too little to feed their families sufficiently.

The ideas that structured the proper role of scientific and medical professionals in political discourse were an additional drag on solving the social questions raised by nutrition: specifically the tension between what a body needs to live versus the question of rights. The historian of science Dana Simmons notes that in his 1793 *Memoir on Respiration,* the chemist Antoine-Laurent Lavoisier developed a "chemical calculus of need" that would set wages for work according to bodily expenditure. The laborer who worked the hardest, and therefore consumed the most fuel, should enjoy the highest wages, so that the bricklayer would earn more than the desk-bound man of letters. Notably this scale bypassed a language of rights for one of need; wages ought to be set in accordance with how hard a person worked, not according to his political right to a set wage that might entitle him to buy more. Lavoisier's formulation was also cast aside by his successors Dumas and Boussingault in favor of a narrower, technical focus on determining the most economical food supply.[517] In his 1998 work on Edwin Chadwick, the historian of medicine Christopher Hamlin notes that in Britain at midcentury, prison administration, poor law reform, and the right work for

[517] Dana Simmons, *Vital Minimum: Need, Science, and Politics in Modern France* (Chicago: University of Chicago Press, 2015), 19–21, 27.

laborers were all discussed in their relationship to what people needed in order to maintain their health. All the same, a fully politicized medicine did not develop in Britain in this period that might orient public policy toward a vision of public health that would encompass social justice. This is in part due to a division between working-class radicals who spoke in the language of democracy and civil rights rather than one of science, and physicians who kept their focus on technical questions related to the health of individuals, rather than exerting their authority over health to public matters like food and work.[518] The American framers of nutrition as a social question too, elided the full implications of their casting of nutrition as a social question. Their language of dietary need also rested on the function of a body and what it needed in its present situation, not his right to anything more than what his labor or status ought to entitle him to under the current system. Even Atwater, who sketched out the fullest articulation of the social meaning of nutrition to the extent that it encompassed human flourishing, confined his vision for what that flourishing might mean to convincing individuals to adjust their own diets to conform to his standards.

The most important reason why the framers of nutrition as a social question failed to find an answer was that the underlying problem of popular nutrition was not how to get people to adhere to a certain perfect diet: it was the fact of an unequal distribution of resources that led to some who had too much, and others who possessed too little. Nutrition science could point to instances of inequality, such as the dietary studies of urban workers and rural people who suffered real need, but the framers of nutrition as a social question were not equipped with the tools to help them either see the problem, or see where political solutions might lie. As the historian of science William Coleman noted in his 1982 book *Death is a Social Disease*, hygienists in early industrial France knew that the urban proletariat faced dire circumstances that led to high rates of illness and death.

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[518] Christopher Hamlin, *Public Health and Social Justice in the Age of Chadwick: Britain, 1800-1854* (Cambridge ; New York: Cambridge University Press, 1998) pp. 48-50.

Yet they could countenance only small-scale reforms to take care of immediate problems, not sweeping changes to the social order that would collapse the disparities between the wealthy and the poor.[519] The same was true for nutrition as a social question, which put in place small-scale fixes for large-scale problems. Telling the workers that their current diet and health status was already the best in the world, tweaking the diet in a poorhouse to bring about moral reform, or educating the working classes to economize on their food were all insufficient tools for solving social problems.

[519] William Coleman, *Death Is a Social Disease: Public Health and Political Economy in Early Industrial France* (Madison: The University of Wisconsin Press, 1982), xviii–xix.

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