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The Political Economy of Nutrition in the Eighteenth Century

I. INTRODUCTION

In 1771 the French physician Pierre-Joseph Buc'hoz published an encyclopaedia of edible plants, running from apricots to 'zerumbeth', or turmeric. The work classified hundreds of foodstuffs from around the globe on the basis of each plant's origins, modes of consumption, nutritive qualities and overall healthfulness. Asparagus for instance was healthy but not very nourishing. Sweet potato, in contrast, was both healthy and nourishing, as well as tasty. Buc'hoz commented that 'it is extremely nourishing, and an excellent food'. In the same years a Sussex shopkeeper recorded in his diary that a vegetable soup he prepared following a recipe in a newspaper provided 'a very good, palatable, cheap, nourishing diet'. Two decades later a Scottish chemist informed the British Board of Agriculture that he had discovered 'the art of making flour from potatoes, from which a bread can be made cheaper than from wheat, and as nourishing'.¹

¹ Pierre-Joseph Buc'hoz, *Manuel alimentaire des plantes: tant indigènes qu'exotiques, qui peuvent servir de nourriture* (Paris, 1771), 101, 119–20; Thomas Turner, *The Diary of Thomas Turner, 1754–1765*, ed. David Vaisey (Oxford, 1984), 131–2; and Minutes of the Board of Agriculture, Committee on Dr Gordon's Discoveries in the Art of Dying, & Making Potatoe Bread, 23 Aug. 1794, fol. 1, SR RASE B/X, Museum of Rural English Life Special Collections, University of Reading.

What did these writers mean when they described a foodstuff as nourishing? According to eighteenth-century dictionaries, nourishing food repaired and sustained the body, but there was agreement about neither the physiological process by which this occurred nor the sure ways to identify the most nourishing foods.² Over a century would pass before scientists elaborated a nutritional paradigm that achieved any degree of hegemony. Yet the word appears constantly in enlightened discussions of food. This article charts eighteenth-century efforts to define the nature of nourishment. It explores the struggle to characterise nourishing foods, and explains why this mattered to eighteenth-century statesmen and others concerned with the wealth and power of nations. It also considers the nutritional opinions of ordinary people, whose own assessments of food's nutritive potential combined with the views of the elite in an uneasy and unequal dialogue.

Food was central to eighteenth-century understandings of political economy and the strength and wealth of nations; one would scarcely expect less from the century that closed with the publication of Thomas Malthus's essay on population, which was as innovative in its conclusions as it was conventional in its conviction that

² 'Nutrir', Real Academia Española, *Diccionario de la lengua castellana*, 6 vols., (Madrid, 1726–39) iv, 695; Gabriel-François Venel, 'Nourissant', 1765, *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers*, eds. Denis Diderot and Jean le Rond d'Alembert, ii, 261–3, University of Chicago ARTFL Encyclopédie Project, ed. Robert Morrissey, <http://encyclopedie.uchicago.edu>; 'Nourish', 'Nourishment', Samuel Johnson, *Dictionary of the English Language*, 2 vols. (London, 1792), ii, n.p.; and 'Nutrire', Francesco d'Alberti di Villanuova and Francesco Federighi, *Dizionario universale critico–enciclopedico della Lingua italiana*, 6 vols. (Lucca, 1797–1803), iv, 278.

food supply was of crucial political importance.³ Historians have long recognised food's importance to these eighteenth-century debates about governance. E.P. Thompson's notion of moral economy after all hinged on the provision of food as a crucial feature of legitimate rule. Thompson's work helped reveal the political and economic principles that animated food riots and other forms of food activism, and showed that long before the concepts of food security and food sovereignty, access to food was a matter of political ethics and economic justice. A flourishing body of scholarship has moreover sought to correlate caloric intakes with eighteenth-century economic growth; Craig Muldrew's analysis of the diets of rural workers for instance argued that better nutrition enabled English agriculture to become significantly more productive. Researchers associated with the *Annales* likewise evaluated the caloric content of a variety of early modern dietaries to ascertain the relationships between agricultural production, food consumption, population growth and industrialisation. It is fair to say that food's relevance to eighteenth-century political and economic history is firmly established.⁴

³ Alison Bashford and Joyce Chaplin, *The New Worlds of Thomas Robert Malthus: Rereading the Principle of Population* (Princeton, 2016).

⁴ For illustrative examples see Michel Morineau, 'Rations de marine (Angleterre, Hollande, Suède, Russie)', *Annales. Économies, sociétés, civilisations*, xx:6 (1965); E.P. Thompson, 'The Moral Economy of an English Crowd in the Eighteenth Century', *Past and Present* [henceforth *P&P*], 1 (1971); Steven Kaplan, *Bread, Politics and Political Economy in the Reign of Louis XV*, 2 vols. (The Hague, 1976); Alan Booth, 'Food Riots in the North–West of England, 1790–1801', *P&P*, lxxvxx (1977); Carole Shammas, 'The Eighteenth–Century English Diet and Economic Change', *Explorations in Economic History*, xxi (1984); Mitchell Dean, *The*

There is however a significant difference between the principles underpinning this modern scholarship and eighteenth-century discussions of food's political and economic importance. Eighteenth-century discussions did not offer estimates of the caloric or nutritional values of particular alimentary regimes because the era lacked techniques for quantifying a food's nutritive qualities. Healthful food was of central importance to eighteenth-century conceptions of national strength and prosperity, but neither statesmen nor scientists could agree on objective methods for evaluating a food's potential to nourish. This article explores the interface between nutrition's unquestioned importance to enlightened political and economic discourse and its evolving position within eighteenth-century scientific and vernacular systems of knowledge. In this it builds on work by scholars such as Nick Cullather and Emma Spary, who have demonstrated that the science of food cannot be separated from

Constitution of Poverty: Toward a Genealogy of Liberal Governance (London, 1991); James Vernon, *Hunger: A Modern History* (Cambridge, 2007); John Bohstedt, *The Politics of Provisions: Food Riots, Moral Economy, and Market Transition in England, c.1550–1850* (Farnham, 2010); Craig Muldrew, *Food, Energy and the Creation of Industriousness: Work and Material Culture in Agrarian England, 1550–1780* (Cambridge, 2011); E.C. Spary, *Eating the Enlightenment: Food and the Sciences in Paris, 1670–1760* (Chicago, 2012); David Meredith and Deborah Oxley, 'Food and Fodder: Feeding England, 1700–1900', *P&P*, ccxxii:1 (2013); and Bernard Harris, Roderick Floud and Sok Chul Hong, 'How Many Calories? Food Availability in England and Wales in the 18th and 19th Centuries', *Research in Economic History*, xxxi (2015).

broader social and political contexts. ‘All estimates of nutritional requirements have to be treated as value judgements’, notes Simon Maxwell.⁵

In *Imagining Poverty* Sandra Sherman argued that the eighteenth-century rise of quantification helped to convert the poor into ‘machines that eat’. Quantification substituted a mass of statistics for individuals with obstinate opinions about their own diets. Sherman noted the proliferation during the eighteenth century of ‘workhouse accounts, scales calibrating bread and work, experiments with “cheap” foods, serial budgets reducing the poor to ledger entries’, and the like.⁶ Notwithstanding such

⁵ See for instance Laura Shapiro, *Perfection Salad: Women and Cooking at the Turn of the Century* (New York, 1986); Simon Maxwell, ‘Food Security: a Post-Modern Perspective’, *Food Policy*, xxi:2 (1996), 159 (quote); Marion Nestle, *Food Politics: How the Food Industry Influences Nutrition and Health* (Berkeley, 2002); Nick Cullather, ‘The Foreign Policy of the Calorie’, *American Historical Review*, cxii:2 (2007); Sandra Aguilar, ‘Cooking Modernity: Nutrition Policies, Class, and Gender in 1940s and 1950s Mexico City’, *The Americas*, lxiv:2 (2007); Gyorgy Scrinis, ‘On the Ideology of Nutritionism’, *Gastronomica*, viii:1 (2008); Spary, *Eating the Enlightenment*; Charlotte Biltekoff, *Eating Right in America: The Cultural Politics of Food and Health* (Durham, 2013); and Emma Spary, *Feeding France: New Sciences of Food, 1760–1815* (Cambridge, 2014).

⁶ Sandra Sherman, *Imagining Poverty: Quantification and the Decline of Paternalism* (Columbus, 2001), 10–11. On quantification see Tore Frangsmyr, J.L. Heilbron and Robin Rider (eds.), *The Quantifying Spirit in the Eighteenth Century* (Berkeley, 1990); M. Norton Wise (ed.), *The Values of Precision* (Princeton, 1995); and Andrea Rusnock, *Vital Accounts: Quantifying Health and Population in Eighteenth–Century England and France* (Cambridge, 2002).

efforts to substitute numbers for bodies, in practice evidence that a particular foodstuff was nourishing could come only from those eating the food. As a 1755 French compendium on diet insisted, ‘it is not possible to determine the quantity of food that each person should consume . . . it is not weight or volume that should serve as a measure, and the only way to be certain comes from inside the body’.⁷ Despite the intense investigation of food chemistry during the second half of the century, and the enormous authority ascribed to quantification as a source of truth, the embodied experience of eaters remained stubbornly central to all discussion of a food’s ability to nourish. Elite schemes to promote particular foodstuffs as suitable for the labouring population thus relied not simply on the expert opinions of doctors and scientists, but also on the bodies and real or purported opinions of the very people at whom these campaigns were aimed. In stark contrast to our current understandings of nutrition, the body of the eater, rather than the chemical qualities of food, formed the bedrock of nutritional knowledge.⁸

The article begins by connecting eighteenth-century discussions of nourishing food to debates about political and commercial prowess. Theorists of the new

⁷ Louis Lémery, *Traité des aliments, où l'on trouve la différence, & le choix qu'on en doit faire*, ed. Jacques Jean Bruhier, 2 vols. (Paris, 1755), i, pp. xlv–xlvi. ‘It is not indeed an easy matter to ascertain the exact quantity of food proper for every age, sex, and constitution. . . Mankind were never intended to weigh and measure their food. Art teaches every creature when it has enough’, stated the Scottish physician William Buchan: *Domestic Medicine: or, a Treatise on the Prevention and Cure of Diseases by Regimen and Simple Medicines* (London, 1776), 67.

⁸ Scrinis, ‘On the Ideology of Nutritionism’, dissects the current focus on food’s chemical qualities.

discipline of political economy concurred that the wealth and power of nations required a healthy population of workers, which in turn required an ample supply of the nourishing foods suitable for the labouring body. As a result, the eating habits of labourers acquired a new political visibility. Nourishing foods were thus increasingly acknowledged to play a central role in building strong nations, but, as the subsequent sections demonstrate, objective scientific characterisation of these important foods proved impossible. In the final analysis, only the people actually eating the food could determine its nutritive power.

Eighteenth-century nutrition was perforce a form of embodied knowledge, not a set of scientific facts. For this reason the vernacular nutritional evaluations of ordinary working people infiltrated more lofty discussions of what constituted a nutritious diet. Although this is a pan-European story I use Britain as a case study. The conclusion sketches the progressive excision of embodied knowledge from the emergent discipline of nutritional science. By the end of the nineteenth century, although the eating habits of ordinary people retained their powerful connections to national well-being, the legitimacy once ascribed to vernacular dietary evaluations had been lost.

II. Nourishing Food, Working People and the Wealth of Nations

Eighteenth-century savants tried persistently to work out how much food an individual, and a nation, required. This was because, as the mathematician and bureaucrat Jean-Louis Lagrange observed, ‘the true measure of the poverty or wealth of a state’ was its ability to nourish its population. For this reason he devoted some thought to designing a ‘calculus of nourishment’ that he used in 1796 to estimate the

nutritional requirements of the new French republic. Via a simple heuristic based largely on bread consumption Lagrange determined that France required about 655 pounds of nourishment per person per year.⁹

Lagrange's calculations, as he himself stressed, were not an abstract exercise. Enlightened discussion of food was inseparable from considerations of national strength and the vitality of the population, which were themselves closely connected. Philosophers, *économistes*, officials and other members of the republic of letters engaged in a prolonged examination of the relationship between the sorts of people inhabiting a territory and its wealth. Interlocutors considered whether a large population was the fundamental motor driving mercantile and commercial success, whether a growing population in itself demonstrated good governance, and whether it was ever possible for a population to become too large for a given territory. Everyone agreed that whatever its size, a nation's population needed to be healthy and energetic. As Michel Foucault argued decades ago, these population debates signalled the emergence of a new approach to the exercise of power, which stressed the importance of aligning state policies to the larger forces that themselves shaped the vigour, size and productivity of a region's inhabitants. Understanding, and developing, these forces would best allow rulers to benefit from the economic and military potential of a high-quality population. The collective prosperity of the political whole

⁹ Joseph-Louis Lagrange, 'Essai d'arithmétique politique sur les premiers besoins de l'intérieur de la république', 1796, *Oeuvres de Lagrange*, ed. J.-A. Serret, 14 vols. (Paris, 1867–92), vii, 578 (quote); Antoine-Laurent Lavoisier *Résultats extraits d'un ouvrage intitulé de la richesse territoriale du royaume de France*, *Oeuvres de Lavoisier*, 6 vols. (Paris, 1864–93), vi, 422; and Dana Simmons, *Vital Minimum: Need, Science and Politics in Modern France* (Chicago, 2015), 231–2.

was thus dependent on the energy and vitality of individuals, whose health acquired an unprecedented economic and political significance.¹⁰

At the heart of this relationship between the wealth and security of nations and the vigour and productivity of the population was the body of the labourer. ‘The true foundations of riches and power’, affirmed one writer, ‘is the number of working poor’. An estate that lacked workers, he added, is ‘good for nothing; and the same rule extends to a whole country or nation’.¹¹ An increase in the health and energy of workers was therefore of direct importance to the state. This, in turn, required an ample supply of nourishing food, because abundant, healthful food helped build strong working bodies. National strength and wealth, explained one of numerous pamphlets on the matter, demanded that working people be ‘plentifully and cheaply fed’. Poorly-nourished labourers would not engender vigorous and robust children, and poorly-fed soldiers scarcely protected the kingdom, as many writers remarked.¹²

¹⁰ James Riley, *Population Thought in the Age of the Demographic Revolution* (Durham, 1985); Sylvana Tomaselli, ‘Moral Philosophy and Population Questions in Eighteenth-century Europe’, *Population and Development Review*, xiv (1988); Rusnock, *Vital Accounts*; Michel Foucault, *Security, Territory, Population: Lectures at the Collège de France, 1977–1987*, ed. Michel Senellart, trans. Graham Burchell (New York, 2009); Yves Charbit, *The Classical Foundations of Population Thought From Plato to Quesnay* (London, 2011); and Bashford and Chaplin, *The New Worlds of Thomas Robert Malthus*.

¹¹ Jonas Hanway, *A Candid Historical Account of the Hospital for the Reception of Exposed and Deserted Young Children* (London, 1759), 10 (quote), 13.

¹² Lémery, *Traité des aliments*, i, pp. xxxix–xxx; Jacques Ballexserd, *Dissertation sur l’éducation physique des enfans* (Paris, 1762), 29; Alexander Dalrymple, *The Poor*

The association of nutritious foods with the labouring capacity of working people is readily perceived in Thomas Bernard's assessment of rice. The wealthy Bernard, who devoted much of his life to charitable initiatives aimed at the working poor, served as treasurer at the London Foundling Hospital in the 1790s, during which time he took a sustained interest in the foods served to the institution's orphans. He regarded rice as an appropriate element of their diet because 'it is a food upon which hard work can be done. It contains a great deal of nutriment in a small compass'. Consequently, he stated, it was 'very useful and proper for the laborious part of the community'.¹³ Rice was suitable for the poor because it was nourishing and so enabled hard work.

Thomas Bernard's belief that nourishing rice was an appropriate food for the laborious part of the community reflects the larger eighteenth-century pursuit of nourishing staples for working people. Concerned to build healthy populations, institutions and individuals across Europe sponsored investigations into promising new foodstuffs and promoted favoured items such as potatoes; the British Board of Agriculture, which had considered Dr Gordon's method of manufacturing nutritious

Man's Friend (London, 1795), 21; J.S. Girdler, *Observations on the Pernicious Consequences of Forestalling, Regrating, and Ingrossing* (London, 1800), 53 (quote), 88; Joaquín Xavier de Uriz, *Causas prácticas de la muerte de los niños expósitos en sus primeros años*, 2 vols. (Pamplona, 1801), i, 85; and Antonio Arteta, *Disertacion sobre la muchdumbre de niños que mueren en la infancia, y modo de remediarla, y de procurar en sus cuerpos la conformidad de sus miembros, robustez, agilidad y fuerzas competentes*, 2 vols. (Zaragoza, 1801–2), i, 16.

¹³ Thomas Bernard, 'On the use of rice', c.1795, Foundling Hospital, London, A/FH/A6/20/2/1–3.

potato bread, had an entire sub-committee devoted to potatoes, and from St. Petersburg and Stockholm to Dublin and Madrid, economic societies and other organisations encouraged the consumption of a range of favoured foods from wild rice and quinoa to maize.¹⁴ These schemes, which extended into Europe's colonial spaces, constitute a topic of analysis in their own right; here I would like to note the connections that advocates drew between those foods they deemed highly nutritious and the energy, health and reproductive capacity of working people. The potato,

¹⁴ On the promotion of new foods by economic societies and scientific institutions see for instance Henry Lowood, *Patriotism, Profit and the Promotion of Science in the German Enlightenment: The Economic and Scientific Societies, 1760–1815* (New York, 1991); Richard Drayton, *Nature's Government. Science, Imperial Britain, and the 'Improvement' of the World* (New Haven, 2000); Emma Spary, *Utopia's Garden: French Natural History from Old Regime to Revolution* (Chicago, 2000); and Koen Stapelbroek and Jani Marjanen (eds.), *The Rise of Economic Societies in the Eighteenth Century* (Basingstoke, 2012). On wild rice, quinoa, maize and potatoes see for instance Redcliffe Salaman, *History and Social Influence of the Potato*, ed. J.G. Hawkes (Cambridge, 2000 [1949]); Eszter Kisbán, 'The Beginnings of Potato Cultivation in Transylvania and Hungary: Government Policy and Spontaneous Process', in John Burnett and Derek Oddy (eds.), *The Origins and Development of Food Policies in Europe* (London, 1994); Lisbet Koerner, *Linnaeus: Nature and Nation* (Cambridge, 1999); David Gentilcore, *Italy and the Potato: A History, 1550–2000* (London, 2012); Spary, *Feeding France*; Anya Zilberstein, 'Inured to Empire: Wild Rice and Climate Change', *William and Mary Quarterly*, lxxii:1 (2015); and Rebecca Earle, 'Food, Colonialism and the Quantum of Happiness', *History Workshop Journal*, lxxxiv (2017).

proclaimed the Scottish agronomist and printer David Henry, was a tasty, wholesome root, which appeased hunger and was eaten with pleasure by young and old. In addition, he observed, it had a further quality to recommend it: ‘it is favourable to population; for it has been observed, that in the western parts of Ireland where it is almost the only dyet of the labouring poor, it is no unusual thing to see six, seven, eight or ten, and sometimes more children’. Henry referred approvingly to the ‘healthy progeny that crowd the cabins of those mean people’. From this he concluded that ‘it is needless to enlarge upon the nutritive qualities of this root’.¹⁵ In short, as Henry’s ready association of nutritive foods with healthy labourers suggests, from the perspective of eighteenth-century political economy nourishing foods merited attention because they produced strong working bodies, and therefore helped create strong and wealthy states.

III. Nutrition Before the Calorie

How to identify these foods was another matter. The late nineteenth-century invention of the calorie provided an ostensibly scientific measure for assessing a food’s capacity to nourish. From the 1870s Max Rubner, Wilbur Atwater and other researchers carried out a range of imaginative experiments aimed at determining the energy value of different foodstuffs. The overall nutritiveness of a dietary regime, in the form of its caloric value, could thus be correlated mathematically with the health and vigour of eaters. The subsequent discovery of vitamins added nuance but did not fundamentally alter the consensus that food requirements could be captured

¹⁵ David Henry, *The Complete English Farmer, or, A Practical System of Husbandry* (London, 1771), 275–6.

numerically, even if there was little agreement on precisely what constituted a ‘balanced diet’ or how much protein or other nutrients any individual body required.¹⁶

Prior to the work of Rubner and Atwater on the science of calories, nineteenth-century chemists, social scientists, agronomists and other professionals laboured to establish universal measures of nutritional need. Chemistry provided a particularly powerful methodology for analysing organic substances of all sorts. From the 1840s, levels of nitrogen and carbon, identified as ‘elementary matter’, were correlated to a food’s ability to nourish. As Dana Simmons has shown, scientists such as Jean Baptiste Dumas believed it possible to represent all dietary requirements ‘in a simple equation’.¹⁷ Whether nutrition consisted simply of the transfer of innate nutritive content from the food to the eater, or whether digestion entailed a more complex process of chemical transformation were matters of debate, but the broader parameters framing the concept of nutrition increasingly located a food’s nutritive value in its chemical composition. This conviction reflects the growing authority of chemistry as a scientific language able to explain human physiology. Eighteenth-century chemistry had not yet attained this authority to explicate the workings of the

¹⁶ Anson Rabinbach, *The Human Motor: Energy, Fatigue and the Origins of Modernity* (Berkeley, 1992); Kenneth Carpenter, *Protein and Energy: A Study of Changing Ideas in Nutrition* (Cambridge, 1994); Harmke Kamminga and Andrew Cunningham (eds.), *The Science and Culture of Nutrition, 1840–1940* (Amsterdam, 1995); Cullather, ‘The Foreign Policy of the Calorie’; Corinna Treitel, ‘Max Rubner and the Biopolitics of Rational Nutrition’, *Central European History*, xli (2008); Biltekoff, *Eating Right in America*; and Simmons, *Vital Minimum*.

¹⁷ Jean Baptiste Dumas, *Traité de chimie appliquée aux arts*, 8 vols. (Paris, 1844), viii, 423; and Simmons, *Vital Minimum*, 27.

human body. Matters of health were the domain of many different fields of expertise. Doctors, chemists, biologists and other learned writers disputed how bodies operated, and more specifically how the human frame gained nourishment from food.

Classical models had long viewed digestion as a form of cooking: the stomach was essentially a stove or pot, which gently heated the food and converted it into chyle, the nutritive mass from which the body drew sustenance. As Ken Albala notes, this image of the stomach as a cooking pot ‘informed nearly every single Renaissance idea about the digestibility of food, and at issue was thus whether a substance was easily broken down by heat’.¹⁸ Foods that passed unchanged through the body provided no nutritional benefit. The individualised nature of Galenic dietetics moreover meant that a food that was nourishing to one person might be useless to someone else. Since each person’s food needs depended on the particular balance of humours that composed their personal ‘complexion’, nourishment was to some degree an individual matter. ‘We should take those kinds of meats which are best for our own particular bodys, for our own particular age, temperature, distemperature & complexion’, noted the seventeenth-century physician Thomas Moffet.¹⁹ Medieval and early modern health manuals repeated tales of unusual diets that proved nourishing to their practitioner, but which could scarcely be recommended for others. One man’s meat was another man’s poison, as the saying went.²⁰

At the same time, such manuals also offered general assessments of a food’s overall nutritive qualities independent of the complexion of the eater. Quinces, according to Moffet, ‘give a wholesome and good nourishment’ when made into

¹⁸ Ken Albala, *Eating Right in the Renaissance* (Berkeley, 2002), 57.

¹⁹ Thomas Moffet, *Health’s Improvement* (London, 1655), 285–6.

²⁰ The phrase derives from Lucretius, *De Rerum Natura*.

preserves.²¹ Nourishment was thus not entirely individualised. Bitter foods were on the whole less nutritious than sweet ones, while ‘grosser’ foods were usually more suited to people engaged in strenuous labour. Only the hot digestive systems of those who took vigorous exercise could concoct dense but nourishing foods such as beef. The feebler systems of more sedentary people would be overwhelmed by these substances. This led dietary writers to recommend foods such as wholegrain breads, bacon, dried beans, hard cheese, and especially beef as appropriate for ‘country persons and hard labourers’.²² Certain extremely nourishing foods was thus linked to the specific digestive capacities of working people.

Many of the features of Galenic dietetics, including its conviction that strenuous work required coarse but nourishing foods such as brown bread, persisted even as alternative models of digestion began to emerge in the seventeenth century. The Dutch physician Herman Boerhaave for instance developed an influential model of digestion framed not as cooking but rather as fermentation. Boerhaave viewed

²¹ Moffet, *Health's Improvement*, 212–3.

²² Charles Estienne and Jean Liébault, *Maison rustique, or the Countrie Farme*, trans. Richard Surflot (London, 1600), 716–18; Moffet, *Health's Improvement*, 32 (quote); Jean Dupèbe, ‘La Diététique et l’alimentation des pauvres selon Sylvius’, in Jean-Claude Margolin and Robert Sauzet (eds.), *Pratiques et discours alimentaires a la renaissance* (Paris, 1982); Muldrew, *Food, Energy and the Creation of Industriousness*, 29–116; Adam Fox, ‘Food, Drink and Social Distinction in Early Modern England’, in S. Hindle, A. Shepard and J. Walter (eds.), *Remaking English Society: Social Relations and Social Change in Early Modern England* (Woodbridge, 2013); and David Gentilcore, *Food and Health in Early Modern Europe: Diet, Medicine, and Society, 1450–1800* (London, 2016).

digestion as a process of transformation, whereby foods moved from being ‘acidescant’ to ‘alkalescent’. Only ‘animal’ substances containing volatile alkalis were able to undergo this transformation effectively, and were therefore most nourishing. Substances that contained fixed alkalis could not sublimate in this way and so offered less nourishment. Animal substances did not derive uniquely from animals; the term implied that they offered an essential principal of nourishment, and were able to build flesh.²³

Boerhaave’s ideas provided a model for theorising digestion, but they did not achieve hegemonic acceptance among physicians or scientists. Precisely how the body converted food into nourishment remained contentious throughout the next century. Competing theories viewed digestion as fermentation or as cooking, or instead emphasised the stomach’s ability to grind food into minute particles. The function and very existence of stomach acid was a topic of considerable dispute. Throughout the eighteenth century scientists across Europe conducted experiments aimed at breaking down edible materials into component parts, with a view to identifying the fundamental nutritive substances. Such experiments nonetheless left unresolved which of these components was ‘the nourishing principle’, and whether there was an ideal diet suited to everyone.²⁴

²³ Carpenter, *Protein and Energy*; J. Worth Estes, ‘The Medical Properties of Food in the Eighteenth Century’, *Journal of the History of Medicine and Allied Sciences*, li (1996); and Allen Debus, *Chemistry and Medical Debate: Van Helmont to Boerhaave* (Canton, 2001).

²⁴ Carpenter, *Protein and Energy*; Estes, ‘The Medical Properties of Food’; Frederic Lawrence Holmes, ‘Biochemistry’, in J.L. Heilbron (ed.), *Oxford Companion to the History of Modern Science* (Oxford, 2003); Spary, *Eating the Enlightenment*;

Chemical laboratories were not the only venues in which learned individuals sought to assess the nourishing qualities of food. Studying living bodies offered another route towards identifying the processes involved in digestion, and thereby the most healthful foods. René Réaumur trained a buzzard to swallow and regurgitate small tubes filled with food that he then examined. He concluded that birds of prey digested meat more completely than starchy foods, and that the process was caused by the action of a ‘dissolvent’ substance rather than by mechanical grinding in the stomach.²⁵ Others used their own bodies. Lazzaro Spallanzani developed a technique for swallowing and then retrieving linen pouches of food, in order to examine the effect of saliva and gastric juices on the breakdown of foodstuffs. Day-old wheat bread, for example, proved more digestible than freshly-baked bread, provided it was eaten without butter.²⁶ In Geneva Henri-Albert Gosse made himself vomit at regular intervals after eating, which allowed him to chart the speed of a food’s conversion

Elizabeth Williams, ‘Food and Feeling: ‘Digestive Force’ and the Nature of Morbidity in Vitalist Medicine’, in Mary Terrall and Helen Deutsch (eds.), *Vital Matters: Eighteenth-century Views of Conception, Life, and Death* (Toronto, 2012); and Spary, *Feeding France*, 56 (quote).

²⁵ ‘Sur la digestion des oiseaux’, *Histoire de l’Académie Royale des Sciences année MDCCLII* (Paris, 1756), 49–71. The bird died during the experimentation.

²⁶ L’Abbé Spallanzani, *Expériences sur la digestion de l’homme et de différents espèces d’animaux*, ed. Jean Senebier (Geneva, 1783), 138; and William Bynum, ‘Self Experimentation’, in Stephen Lock, John Last and George Dunea (eds.), *Oxford Companion to Medicine* (Oxford, 2001).

into chyle.²⁷ Using this information he ranked food according to its digestibility. Dried egg white proved highly indigestible, as did raisins and melon pips. Boiled fish, potatoes and spinach were all highly digestible. He also confirmed Spallanzani's assessment of the merits of day-old butterless bread. Examination of his faeces convinced Antoine-Alexis Cadet de Vaux that bran-rich bread was not nutritious, because it left 'spongy, voluminous, poorly-cohesive material'.²⁸ William Stark carried out such a rigorous programme of self-experimentation that he died. He had followed a series of highly restricted diets, living for months at a time on only bread and water, or boiled pudding, with the aim of determining the minimum requirements for health. He carefully noted his physiological responses, and also the quantity of excreta, again to determine how well his body was able to extract nourishment from different foodstuffs. As he recorded, after months of such diets he began to suffer from bleeding gums, and eventually expired from what doctors later determined was scurvy.²⁹

Digestibility, however, was not synonymous with nutritiveness. Foods could be highly digestible but not very nourishing. It was nourishing foods, not easily

²⁷ [Henri-Albert] Gosse, 'Additional Experiments on Digestion', *A New Review with Literary Curiosities, and Literary Intelligence, for the Year 1783* (London, 1783), iv, 116–20.

²⁸ Spary, *Feeding France*, 83. Or see Anne-Charles Lorry, *Essai sur les aliments, pour servir de commentaire aux livres diététiques d'Hippocrate*, 2 vols. (Paris, 1757), i, 143–4.

²⁹ William Stark, *The Works of the Late William Stark, M.D., Consisting of Clinical and Anatomical Observations, with Experiments, Dietetical and Statistical*, ed. James Carmichael Smyth (London, 1788).

digestible ones, that working people required. The *Encyclopédie* stated this clearly in its entry on food: ‘too-easily digested foods are not sufficient to restore the forces of labourers, workers and robust people who place heavy demands on the human machine’.³⁰ A chemical characterisation of the nourishing foods required by working people remained elusive. One line of investigation focused on gluten. In 1745 Jacopo Bartolomeo Beccari for instance derived an alkalescent, glutinous substance from white flour that he believed contained the true nutrient in wheat.³¹ The chemist Antoine Augustin Parmentier maintained that starch, not gluten, was ‘the alimentary principle *par excellence* of the floury foods’.³² Others championed mucilage, or the gelatinous juices derived from meat, or particular oily substances.³³ Overall, as Emma

³⁰ Louis, Chevalier de Jaucourt, ‘Nourriture’, 1765, *Encyclopédie*, xi, 263.

³¹ Jacopo Bartolomeo Beccari, ‘De frumento’, *De Bononiensi Scientiarum et Artium Instituto atque Academia Commentarii*, ii:1 (Bologna, 1745), 122–7; and Carpenter, *Protein and Energy*, 10–11.

³² Antoine Augustin Parmentier, *Observations on Such Nutritive Vegetables as May be Substituted in the Place of Ordinary Food, in Times of Scarcity* (London, 1783); Antoine Augustin Parmentier, *Traité sur la culture et les usages des pommes de terre, de la patate, et du topinambour* (Paris, 1789); and Spary, *Feeding France*, 67 (quote), 87.

³³ Gabriel-François Venel, ‘Digestion (*Oeconom. Anim.*)’, 1754, *Encyclopédie*, iv, 1001; Venel, ‘Nourrissant (*Chimie & Diète.*)’, 262; Lorry, *Essai sur les alimens*; Jean-Jacques Paulet, *Traité des champignons*, 2 vols. (Paris, 1790–3), ii, 21–2; William Buchan, *Observations Concerning the Diet of the Common People, Recommending a Method of Living Less Expensive, and More Conductive to Health, than the Present* (London, 1797), 24; William Turnbull, *The Naval Surgeon*;

Spary has established, from the perspective of eighteenth-century science the definition of nourishment ‘was neither inevitable nor self-evident’.³⁴

Despite concerted pan-European efforts, eighteenth-century scientists failed to reach consensus on the chemical components of nourishment. Nor did they concur about the best methodology for understanding digestion. Nonetheless, they agreed that the nature of nourishment was of immense political and economic importance. This was why scientists across Europe so assiduously investigated the properties of gluten and mucilage. Of course some investigations were also motivated by the desire to determine which diet best suited the well-fed clients of private physicians, but a far larger purpose animated the Enlightenment’s attempt to unravel the science of nutrition. This was to identify the optimal foods for different types of labouring body. Accomplishing this was, as the chemist (and influential potato-promoter) Parmentier stated, a matter ‘worthy of the meditations of philosophers and the protection of government’.³⁵

IV. Negotiating Nutrition in the Royal Navy

comprising the Entire Duties of Professional Men at Sea (London, 1806), 32; Ken Albala, ‘Insensible Perspiration and Oily Vegetable Humor: An Eighteenth-Century Controversy over Vegetarianism’, *Gastronomica*, ii:3 (2002); and Spary, *Feeding France*.

³⁴ Spary, *Feeding France*, 5–6 (quote), 316–17.

³⁵ Antoine-Augustin Parmentier, *Les Pommes de Terre, considérées relativement à la santé & à l’économie: ouvrage dans lequel on traite aussi du froment & du riz* (Paris, 1781), 3–4.

Nowhere were concerns about national strength and security, nourishing food, and working bodies more closely entwined than in the demands of naval provisioning. Efforts to feed the British Royal Navy illustrate this well. Despite the popular image of naval rations as consisting of maggotty biscuit and rotten meat, recent research has established that sailors in the Royal Navy were well-fed. This ‘body of men essential to the existence of the empire’ was recognised as requiring a highly nourishing diet.³⁶ The monumental task of feeding the Navy was undertaken by the Victualling Board, established in 1683 to oversee all matters related to naval provisions. Its multi-million-pound budget reflects the importance the British state ascribed to the enterprise. The Board’s scrupulous records demonstrate that the slightest variation from the regulations was liable to attract an audit, both because it might represent an attempt at defrauding the exchequer and because sub-standard rations undermined the Navy’s fighting strength.

Providing sailors with nutritious food was thus a matter of state concern, but who had the authority to determine what constituted a nourishing diet? How much food was enough to ensure a healthy and effective fighting force? The bureaucratic demands of provisioning a large organisation required quantifiable answers, but

³⁶ Admiral Philip Patton, ‘Strictures on Naval Discipline and the Conduct of a Ship of War, intended to produce a uniformity of opinion among sea offices’, c.1807, *Shipboard Life and Organisation, 1731–1815*, ed. Brian Lavery (Aldershot, 1998), 629 (quote); Janet Macdonald, *British Navy’s Victualling Board, 1793–1815: Management Competence and Incompetence* (Woodbridge, 2010); Roger Knight and Martin Wilcox, *Sustaining the Fleet, 1793–1815. War, the British Navy and the Contractor State* (Woodbridge, 2010); and Janet Macdonald, *Feeding Nelson’s Navy: The True Story of Food at Sea in the Georgian Era* (London, 2014).

eighteenth-century attempts to reform naval rations illustrate that these were not easy to obtain. The result was a nutritional regime based not on authoritative science but rather constant micro-negotiations, in which ordinary sailors maintained a tense but on-going dialogue with representatives of the state.

The boatswain's mate James Morrison offered a clear description of this process in the journal he kept during a voyage in 1788. Morrison served under William Bligh on the ill-fated *Bounty*. Morrison's journal documents the progressive breakdown in shipboard relations, as Bligh's short temper exacerbated disputes over provisions. Sailors were keenly attuned to the nutritional equivalences between different foodstuffs and the substitution of one food for another invited disputation about whether the two were truly equivalent in terms of nourishment. In the case of the *Bounty*, arguments over the food supply began soon after the vessel left Britain. The ship's stock of cheese was inexplicably small, and the quality of the meat provoked complaints. Real trouble however did not begin until Bligh attempted to replace the bread ration with some of the pumpkin acquired during a stop in Tenerife. Morrison recorded that the crew wanted to know 'at what rate the exchange was to be'. They were told that one pound of pumpkin was to be treated as two pounds of bread. 'This', Morrison reported, 'they refused'.

How could a lesser quantity of pumpkin equal wheat bread's nourishing and sustaining qualities? Only the threat of violence compelled the *Bounty*'s crew to eat this so-called substitute. 'You damned infernal scoundrels', Bligh reportedly roared, 'I'll make you eat grass or anything you can catch before I have done with you'.³⁷ As Greg Dening recounted in his masterful analysis of the misadventures of the *Bounty*

³⁷ James Morrison, *After the Bounty: A Sailor's Account of the Mutiny and Life in the South Seas*, ed. Donald Maxton (Washington, 2010), 11–12.

and its crew, disagreements about the nutritive equivalencies of different substitutions dogged the ship's progress to the Pacific. The crew, he writes

wanted to know what four gallons of Mrs Dubois' portable soup with peas and sauerkraut that Bligh provided was equivalent to. . . Were six plantains a day equivalent to the bread allowance that should have been theirs? What was the equivalent to a pound of fresh pork, and, when that was gone, to what was a pound of yams or taro a day equivalent?.

Bligh claimed that his allowances 'were made on legal equivalents between yams and bread'.³⁸ These substitutions led to quarrels; the ship's cook emerged from one with broken ribs.

Naval regulations in fact established tables of equivalence for precisely such occasions. Standard British naval provisions consisted of meat, flour, oatmeal, cheese, butter and beer, in fixed quantities. The *Regulations and Instructions Relating to His Majesty's Service at Sea*, issued repeatedly from the 1730s, spelled out the acceptable degree of variation from these rations. One pint of olive oil might be substituted for one pound of butter, while half a pound of rice was declared equal to a pint of oatmeal. Flour rations could be increased or decreased in fixed proportions to the quantity of meat supplied.³⁹ Table One, from 1757, lists the substitutes typically

³⁸ Greg Denning, *Mr Bligh's Bad Language: Passion, Power and Theatre on the Bounty* (Cambridge, 1992), 74–6, 107.

³⁹ See for instance '1745 Regulations and Instructions Relating to His Majesty's Service at Sea', *Shipboard Life and Organisation, 1731–1815*, ed. Lavery, 18–19; *Regulations and Instructions Relating to His Majesty's Service at Sea* (London, 1772), 61–8; *Regulations and Instructions Relating to His Majesty's Service at Sea*

allowed. [See Table One.] The victualing contracts issued to naval suppliers moreover varied with the location in which fleets were to operate, reflecting the impossibility of securing identical supplies in all parts of the world. Contracts in the East Indies for instance included dhal.⁴⁰ Since the Seven Years' War, these regulations had established that one pound of bread was equal to two pounds of potatoes or yams; Bligh's pumpkin substitution reversed this ratio and the crew noticed.⁴¹ TABLE ONE
HERE.

Tables of approved substitutions sought to ensure consistent levels of nourishment, so that sailors could perform their duties, but they could not address every possible alternative to the standard ration. Nor was it clear how to formalise equivalencies between existing rations and potential new additions. The increasing popularity of foods such as sugar and cocoa proved particularly challenging. From the 1780s officers and sailors campaigned for these foods to be added to the official rations. Although convinced of their nutritional merits, the Victualling Board struggled to incorporate them into the ration tables. Exactly how much cocoa was required to equal the nutritive qualities of a pound of butter? Naval provisioning thus provides a very concrete example of eighteenth-century practical nutrition, which converted ideas about nourishment drawn from a range of sources into quantifiable tables of equivalents. The incorporation of hot chocolate into the official rations illustrates well how this process worked.

(London, 1808), 287–8; Macdonald, *British Navy's Victualling Board*; Knight and Wilcox, *Sustaining the Fleet*; and Macdonald, *Feeding Nelson's Navy*.

⁴⁰ Knight and Wilcox, *Sustaining the Fleet*, 139.

⁴¹ Christian Buchet, *Marine, économie et société. Un Exemple d'interaction: l'avitaillement de la Royal Navy durant la Guerre de Sept Ans* (Paris, 1999), 67.

While stationed in the Caribbean in the 1790s Rear Admiral Philip Affleck became convinced that in warm climates the butter or oil stipulated as part of the standard ration was detrimental to sailors' health. He believed that hot chocolate—a beverage commonly drunk in the Americas—made a far more suitable contribution to the naval diet. At what rate, however, should the beverage be substituted for butter? Affleck first tried three-quarters of a pound of sugar and six ounces of cocoa, in lieu of the regulation pound of butter. This was costly enough, as he noted, given the 'present distracted state of Hispaniola' resulting from the Haitian revolution, which reduced the supply of both commodities. Nonetheless, Affleck soon determined that this quantity was insufficient, and increased the ration to a pound of sugar, and half a pound of cocoa. That this was the appropriate size he determined through experiment, or as he put it, 'upon trial'. Affleck thus based his evaluation on the opinions of the sailors themselves.⁴²

The Victualling Board questioned Affleck's nutritional assessment. While conceding that butter was by 'no means so wholesome in a warm climate as cocoa and sugar', they characterised Affleck's new rations as 'superabundant'. They

⁴² Victualing Office to Philip Stephens, 31 May 1792, National Maritime Museum, Greenwich [henceforth NMM] ADM DP/12; and Out letters of Victualing Board, board to Philip Stevens, 24 April 1794, National Archives, Kew [henceforth TNA] ADM 110/39. Other officers agreed about the merits of sugar and cocoa versus 'our nasty oil': William Waldegrave, Martello Bay, 11 June 1794, NMM WDG/5/4. For the ubiquity of cocoa—consumption in the Americas see Ross Jamieson, 'The Essence of Commodification: Caffeine Dependencies in the Early Modern World', *Journal of Social History*, xxxv:2 (2001); and Marcy Norton *Sacred Gifts, Profane Pleasures: A History of Tobacco and Chocolate in the Atlantic World* (Ithaca, 2008).

proposed an alternative rate of exchange: one pound of butter to be replaced by a mixture of sugar and cocoa totalling a pound, rather than the pound and a half advocated by Affleck. Like Affleck, the Board based its proposed equivalence on practical experience; it noted that past practice had demonstrated that a pound of sugar constituted an acceptable substitute for a pound of butter, and therefore that a mixture of sugar and cocoa totalling a pound was equivalent to a pound of sugar. They also noted with dismay the considerable expense that Affleck's new ration would occasion, and referred the matter to the Admiralty. Neither the Board nor Affleck cited any scientific or medical evidence to justify their position. Their nutritional arguments revolved entirely around precedent, cost and the personal opinions of sailors and officers. In the end, although it took its time, the Board in 1803 endorsed precisely the sugar-cacao ratios that Admiral Affleck had determined through trial and error a decade earlier.⁴³

Similar negotiations accompanied the incorporation of sweetened rice pudding into the rations. Officers had for some years campaigned to replace the unpopular butter ration with rice and sugar, but as with hot chocolate the rate of exchange was difficult to determine. The Board first experimented with a one-to-one exchange, whereby three-quarters of a pound of sugar and a quarter-pound of rice could replace a pound of butter. This ratio, however, was 'found insufficient' and from 1795 the

⁴³ Out letters of Victualing Board, board to Philip Stevens, 24 April 1794, TNA ADM 110/39; Victualling Office minute, 13 Oct. 1803, NMM ADM/D/45; Minutes of Victualing Board, 13 Oct. 1803, TNA ADM 111/169; *Regulations and Instructions Relating to His Majesty's Service at Sea* (London, 1808), 288; Macdonald, *British Navy's Victualling Board*, 19; and Macdonald, *Feeding Nelson's Navy*, 43–4.

rate was increased to half a pound of sugar and a pound of rice to a pound of butter. The dissatisfaction of sailors again led to a change of policy and a new ration.⁴⁴

This was, in general, how equivalencies were established both in the official ration tables and more fleetingly during individual voyages. The crew of the *Daedalus* voluntarily exchanged their ration of rice for yams, pumpkins and sweet potatoes while the vessel was stationed in the Moluccas, with which they were able to make a hearty meal, in the view of the ship's surgeon.⁴⁵ Molasses, which by the early nineteenth century could replace part of the oatmeal ration, allowed sailors to construct a much-appreciated sweetened porridge, described by another surgeon as 'highly palatable, nutritive, antiscorbutic and invigorating', particularly suitable for those undertaking heavy labour. In reaching this conclusion the surgeon drew on both an arsenal of medical texts and the opinions of the sailors he had encountered during his years of service in East Asia.⁴⁶

The Navy thus lacked an objective technique for working out how much sugar and cocoa matched the nourishment of an equal weight of butter, just as Bligh lacked a robust method for demonstrating that two pounds of bread was the equivalent of one pound of pumpkin. Bligh relied on a display of force to impose his nutritional

⁴⁴ Out letters of Victualing Board, board to Philip Stevens, 23 April 1794, TNA ADM 110/39; Out letters of Victualing Board, 13 July 1794, TNA ADM 110/40; and Minute book of Victualing Board, Monday 26 January 1795, TNA ADM 111/134.

⁴⁵ Peter Henry, Surgeon's journal, HMS *Daedalus*, 1802, TNA ADM 101/96/1.

⁴⁶ John Collum, Surgeon's journal, HMS *Terpsichore*, 1802–3, TNA ADM 101/122/4. Richard Wilk, *Home Cooking in the Global Village: Caribbean Food from Buccaneers to Ecotourists* (Oxford, 2006) discusses British sailors' deep affection for burgoo and other porridges.

opinions on the *Bounty*'s crew. The Victualling Board, concerned as it was with ensuring the strength of the British Navy while also keeping costs down, sought to balance sound nutrition with careful accounting. Expenditure was easy to quantify, but nourishment was not. Naval ration tables thus offer a clear example of the challenges posed by the practical demands of establishing nutritional paradigms in an era before the calorie.

V. Nutrition as Embodied Knowledge

The difficulties in establishing a measure of nutritiveness, as well as the close links between measuring nourishment and feeding workers, are revealed equally clearly in discussions of the numerous recipes for 'poor soups' that circulated during the eighteenth century. From mid-century charitable associations in many countries established soup kitchens providing starchy soups for the needy, in response to recurrent crises in the availability of grain. Newspapers across Europe printed and reprinted recipes for economical soups; it was one such recipe that the Sussex shopkeeper Thomas Turner labelled 'a very good, palatable, cheap, nourishing diet'.⁴⁷

⁴⁷ See note 1. Turner prepared a recipe from *Universal Magazine*, xxi (1757), 268–71.

Or see *Appendix to the Scots Magazine* (Edinburgh, 1740); *Bibliothèque physico-économique, instructive et amusant*, i (Paris, 1790), 238–49; *Magasin encyclopédique*, v (Paris, 1799), 333–40; *Semanario de agricultura y artes dirigido a los párracos*, vii (Madrid, 1800), 30 Jan., 27 Feb., 6 March, 19 June, and x (Madrid, 1801), 23 July 1801; *Journal de physique, de chimie, d'histoire naturelle et des arts*, li (Paris, 1800), 310–24; and *European Magazine and London Review* (April 1801), 256.

Poor houses and orphanages added such dishes to their menus, cookbooks explained to the home cook how to make economical soups for distribution to the poor, and patriotic individuals offered premiums for the labourer who could invent ‘the most wholesome and nutritious soup, costing not more than 5d. a gallon’, which he and his family themselves consumed.⁴⁸ The most famous soup of all was the one popularised

⁴⁸ Manuscript recipe book, Lancashire Archives, Preston [henceforth LA], DDB acc 6685, Box 179 b. 34, third folder; Claude-Marc-Antoine Varenne de B ost, *La Cuisine des pauvres ou Collection des meilleurs M moires qui ont parus depuis peu* (Dijon, 1772); Arthur Young, *Annals of Agriculture and Other Useful Arts*, xxiv (London, 1795); Hannah More, *The Cottage Cook; or, Mrs. Jones’s Cheap Dishes: Shewing the Way to do Much Good with Little Money* (London, [1795]); Henrique Doyle, *Tratado sobre el cultivo, uso y utilidad de las patatas o papas, e instrucci n para su mejor propagaci n* (Madrid, 1797); [Antoine-Alexis] Cadet-Devaux *et. al.*, *Recueil de Rapports, de m moires et d’exp riences sur les soupes  conomiques et les fourneaux a la Rumford* (Paris, 1801); Junta P blica de la Real Sociedad Econ mica de Amigos del Pa s de Valencia (Valencia, 1801); Manuscript recipe book, English, c.1798–1826, ‘Recipes for cures and cookery, c.1802–1826’, Schlesinger Library, Harvard University, Cambridge, AR297; and *Ensayos de comidas econ micas   la Rumford hechos por una comisi n nombrada   este fin por la Real Sociedad Econ mica Matritense* (Jaen, 1803). See also Paula Demerson, ‘La distribuci n de sopas econ micas por la real sociedad matritense en 1803–1804’, *Bolet n de la Real Academia de Historia*, clxiv (1969); Fritz Redlich, ‘Science and Charity: Count Rumford and his Followers’, *International Review of Social History*, xvi:2 (1971); Roger Wells, *Wretched Faces: Famine in Wartime England, 1793–1801* (Gloucester, 1988); Anna Gonnella, ‘L’Assistenza Pubblica a Trieste: l’Alimentazione nell’Istituto

by Benjamin Thompson, the US-born advisor to Karl Theodor, the elector of Bavaria. Thompson, or Count Rumford, as he was known following his ennoblement, spearheaded a number of schemes to rationalise the Bavarian state's management of soldiers, paupers and other actual or potential workers. As part of this larger effort he scrutinised the diet proffered by the Munich poorhouse, with a view to increasing its nutritive qualities and decreasing its cost. His aim was to identify 'the *cheapest*, most *savoury*, and most *nourishing* Food that could be provided'.⁴⁹ This he determined to be a soup comprising potatoes, barley, salt, vinegar, and croutons. Thompson calculated in detail the cost per serving of his various soups, taking into account the quantity of wood required, and the wages of the cook, along with the cost of the ingredients. These calculations allowed him to demonstrate unequivocally that his soup cost about a third of a British penny per serving. As he observed, the use of his specially-designed fuel-economising stove was partly responsible for this low cost. [See Table Two.] His approach thus reflected the increasing authority according to quantification as a technique for producing truth.⁵⁰ TABLE TWO HERE.

dei Poveri (1818–1918)', in Paola Carucci (ed.), *Gli Archivi per la Storia dell'Alimentazione*, 3 vols. (Rome, 1995), iii; J.M. Valles Garrido, 'La distribución de sopas económicas del Conde Rumford en la Segovia de comienzos del siglo XIX', *Estudios segovianos*, xcii (1995); and Spary, *Feeding France*. For a premium see *European Magazine and London Review* (June 1800), 427 (quote).

⁴⁹ Benjamin Thompson, 'Of Food and Particularly of Feeding the Poor', *Essays, Political, Economical and Philosophical*, 3 vols. (London, 1796), i, 192 (emphasis as in original).

⁵⁰ Sherman, *Imagining Poverty*, dissects Rumford's use of quantification.

Thompson believed that his soup was not only extremely tasty and cheap, but also immensely nourishing. He explained that the appropriate serving size was about five ounces. This quantity, he stated, was ‘quite sufficient . . . to make a good meal for a strong, healthy person’. In striking contrast to his detailed calculations of cost, however, his statements about the soup’s nutritive qualities were not supported by any figures or quantification. His assertion that five ounces was an appropriate serving was instead based on ‘long experience’. This demonstrated that that quantity was enough to ‘satisfy the hunger of a grown person’.⁵¹ In identical fashion, the promoter of a similar soup in London relied on information obtained for a ‘poor miserable family’ to prove that a twenty-ounce serving constituted a ‘*nutritive, palatable, and abundant meal*’. The family was instructed to ‘make a *good meal*, and to return next day and inform him how much satisfied them’.⁵² Determining whether these soups were nourishing therefore required information available only to the eater.

Thompson’s comparison of the nutritive qualities of maize and rice relied on similar embodied science. Drawing on his upbringing in North America, Thompson advocated maize as ‘the cheapest and most nourishing Food known’. Rice, he stated, was reputed to be very nourishing—this indeed was the view of his friend Thomas Bernard of the London Foundling Hospital—but evidence ‘prove[d] in a very decisive and satisfactory manner’ that it was less nourishing than maize. This decisive

⁵¹ Thompson, ‘Of Food’, 194–5. For comparable examples of detailed monetary calculations together with an absence of nutritional quantification see [Jonas Hanway], *The Great Advantage of Eating Pure and Genuine Bread, Comprehending the heart of the Wheat* (London, 1773), e.g. 8–9, 27–32.

⁵² [Patrick Colquhoun], *An Account of a Meat and Soup Charity* (London, 1797), 6–9 (emphasis as in original).

evidence did not derive from scientific analysis. Thompson instead owed it to people ‘acquainted with the details of feeding the negro slaves in the southern states of North America, and in the West Indies’. These sources reported that when enslaved workers were given the option of eating either rice or maize they invariably chose maize. ‘The reasons they give for this preference they express in strong, though not in very delicate terms.—They say that “*Rice turns to water in their bellies, and runs off*”—but ‘Indian Corn ‘*stays with them, and makes strong to work*’’, he reported.⁵³ For Thompson, the measure of nourishment lay in the body of the eater, not in the chemical laboratory.

The physician James Clark, who practiced in Dominica in the last decades of the century, drew on a variety of metrics to assess the nutritive qualities of plants commonly eaten in the West Indies. In keeping with his belief that starch was the nourishing principle of all foods, his primary measure was the amount of ‘amylaceous’ or starchy matter contained in each vegetable. He carefully extracted the starch from sweet potatoes, plantains and a number of other plants, and then compared the results. Because sweet manioc contained more starch than the bitter variety, he concluded that it must be the more nourishing of the two.⁵⁴ The quantity of

⁵³ Thompson, ‘Of Food’, 242–3 (emphasis as in original). For an analysis of such ‘second-hand oral evidence’ see Carolyn Steedman, *Labours Lost: Domestic Service and the Making of Modern England* (Cambridge, 2009), 261–9 (quote); and Albala, ‘Insensible Perspiration’.

⁵⁴ James Clark, ‘An Account of Some Experiments Made with a View to Ascertain the Comparative Qualities of Amylaceous Matter, Yielded by the Different Vegetables Most Commonly in Use in the West Indian Islands’, *Medical Facts and Observations*, vii-viii (London, 1797), 304.

starch did not however provide the sole measure of the plant's nourishing qualities. Discussing Guinea yam, sweet potatoes and eddoes, Clark noted that 'the first two contain equal quantities of starch, and they are all three found to be remarkably nourishing, when well boiled or roasted'. Their high starch content correlated with, but did not in itself establish, their nutritive potential. He likewise referred to other plants which 'also contain starch, and are looked upon to be very nutritious'. To some degree a plant's reputation as nourishing confirmed that starch was a nutritive principle, rather than the reverse.

Clark in fact employed a second, entirely separate metric to evaluate nutritiveness. His experiments did not examine an arbitrary collection of plants. Rather, he systematically studied the qualities of the foods that formed the mainstay of the enslaved diet; yams, sweet potatoes, couch-couch, plantains and the like were, as he stated, the 'chief support . . . of the negroes in the West Indies'. His studies therefore precisely illustrate the connections between analyses of nutrition and the creation of a hard-working and productive labour force. Clark also wished to disprove abolitionist claims that the enslaved population was under-fed. These multiple concerns are clearly reflected in his assessment of the sustaining qualities of sugar-cane. Clark believed that sugar cane, or more specifically the large quantity of 'saccharine matter' it contained, was highly nourishing. His evidence however was drawn not from chemistry but rather observation. 'The nutritive quality of its juice', he reported, 'is unquestionably very great, as the negroes in crop time, on sugar plantations, are observed to be constantly fat and healthy, and their chief nourishment, during this time, is known to be this juice raw or a little boiled'. The healthy

appearance he claimed to observe among cane-workers demonstrated that their diet was nourishing.⁵⁵

Clark thus employed an alternative measure of nutritiveness when he classified sugarcane as nourishing. Rather than relying on a chemical analysis of the food he assessed the bodies of the eaters. This was the model that Adam Smith employed in his comparison of the nutritive qualities of oatmeal, wheat and potatoes. In the first volume of *The Wealth of Nations* he noted that oatmeal bread was sometimes alleged to be ‘a heartier food for labouring people than wheaten bread’. Smith was sceptical of this claim because ‘the common people in Scotland, who are fed with oatmeal are in general neither so strong nor so handsome as the same rank of people in England, who are fed with wheaten bread. They neither work so well nor look so well’. Just as Clark felt able to assess the nourishment derived from sugar cane by assessing the bodies and vigour of enslaved labourers, so Smith determined the relative nourishment derived from wheat and oats through a consideration of the appearance and labouring capacity of wheat and oatmeal eaters. He employed a similar method in his endorsement of potatoes. He noted that in London potatoes formed the principal food of porters, coalheavers and prostitutes—‘the strongest men and the most beautiful women perhaps in the British dominions’. No food, he concluded ‘can afford a more decisive proof of its nourishing quality’.⁵⁶ Potatoes were nourishing because the people who ate them were beautiful, strong and energetic.

⁵⁵ Clark, ‘An Account’, 305–7. The abundant scholarship on health and the plantation system provides little support for Clark’s claim.

⁵⁶ Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, 2 vols. (London, 1776), i, 201–2.

The notion that body of the eater revealed the nutritive qualities of the food was widely shared. When Frederick Eden, the author of a monumental history of the English labouring classes published in 1797, disputed Smith's critique of oatmeal bread, he did not resort of the language of science. Rather, he challenged Smith's assessment of the appearance of oatmeal-eaters. Against Smith's claims that oatmeal-eaters were 'neither so strong nor so handsome' as wheat-eaters, Eden cited 'the very healthy appearance' of those inhabitants of Lancashire who subsisted principally on oat-bread. In his opinion, 'handsomer and more muscular men are not reared in any part of the British dominions, than in those countries where the oat meal diet is predominant'. He referred specifically to the 33rd and Lancashire Regiments, comprised largely of oatmeal-eaters. These units, he claimed, contained 'some of the finest looking soldiers in his Majesty's service'.⁵⁷

Eden was not unfamiliar with the view that nutrition was in some way correlated with the chemical composition of a food. In his discussion of wheat, for instance, he affirmed that any nutritional superiority it might possess must derive from its 'containing a considerable quantity of *animal matter*'.⁵⁸ He thus referenced the idea, popularised by Boerhaave, that 'animal substances' underpinned a food's nutritive qualities. At the same time, by centring their analyses around the bodies of labouring men—whether coalheavers or members of the Lancashire Regiment—Eden and Smith made clear why they were interested in the nutritive value of food. They aimed fundamentally at identifying ways to create a healthy and productive

⁵⁷ Frederick Morton Eden, *The State of the Poor, or a History of the Labouring Classes in England, from the Conquest to the Present Period*, 3 vols. (London, 1797), i, 513.

⁵⁸ Eden, *The State of the Poor*, i, 526.

population of workers and soldiers. The bodies of such eaters thus lay at the centre of any discussion.

The connection between nutritive foods and the productive capacity of labouring people was particularly clear in discussions of the diet of the enslaved. Clark and Thompson were alone neither in their interest in determining the nutritive qualities of the enslaved diet, nor in their belief that the bodies of enslaved people demonstrated whether a food was nutritious. Eden for instance championed maize as ‘particularly nutritious’, citing its frequent consumption by enslaved workers in Maryland, where his father had served as governor. He reported that it formed the principal food of the ‘field negroes in the Middle States of North America who are an healthy and hardy race of people: and whose labour is constant, and sometimes severe’. Like Thompson, Eden did not rely solely on his own (second-hand) assessment of maize’s impact on the working body. He also cited the purported opinion of the eaters themselves. ‘Negroes’, he claimed, ‘have a notion that they never would have strength sufficient to undergo their daily toils, if fed only on wheaten-bread’.⁵⁹ This hearsay evidence was intended not simply to confirm the nutritive qualities of maize. It was also a swipe at labourers in England’s southern counties who, to Eden’s immense exasperation, rejected what he viewed as nutritionally-superior breads made of oats, barley and maize in favour of wheaten loaves. If enslaved workers in North America could labour unrelentingly on a diet of maize, then there was no reason why agricultural labourers in Dorset could not do so as well. At the same time, Eden’s critique relied on the alleged dietary opinions of working people themselves.

⁵⁹ Eden, *The State of the Poor*, i, 521–4.

Eden's and Thompson's use of the opinions of 'field negroes' to demonstrate maize's nutritious qualities thus accorded some importance to the dietary evaluations of the people actually eating the food whose nutritive qualities were under review. If field negroes were not considered qualified to assess the impact of maize on their ability to work, Eden would not have offered their supposed views as evidence. In like fashion, William Stark's assessment of the impact of his eccentric diets on his own constitution was premised on the assumption that he, as the eater, possessed some expertise in determining whether a food was nourishing. Stark's notes on his experiments detailed the level of energy and vitality that he felt while following each regimen. He also recorded his deteriorating appearance, plotting the pimples, spots and other blemishes that signalled his declining health. Of course, Stark, a physician trained at Glasgow, London and Leiden, possessed entirely different qualifications to make truth claims than did Eden's 'field negroes'. As Simon Shaffer and others have reminded us, the status of a fact depends in large part on the status of its reporter. In general, as Shaffer noted, during this period working people such as the enslaved 'were scarcely [considered] capable of acting as authors of corporeal reports'.⁶⁰

Why then did Eden and others cite these purported opinions? Their appeal to the corporeal experience of enslaved eaters was not simply a rhetorical device intended in Eden's case to chastise the dainty habits of wheat-eating labourers in England's southern counties. Neither was it solely an exercise in appropriation, whereby elite observers laid claim to information actually originating from subaltern informants. Eden's second-hand referencing of the opinions of enslaved workers was

⁶⁰ Simon Shaffer, 'Self-Evidence', *Critical Inquiry*, xviii:2 (1992), 339; and Steven Shapin, *Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago, 1994).

certainly both of these things, but it also reflected the epistemological importance of embodied experience in the evaluation of whether a food was nourishing. My point is not that the enslaved truly shared Eden's enthusiasm for maize, but that Eden believed his argument was enhanced by referencing their alleged views.

Ultimately, eighteenth-century savants were obliged to rely on the evidence of experience because they had not elaborated a single, widely-accepted paradigm to account for food's ability to nourish. This is why in his analysis of the nutritive value of potatoes the French scientist Antoine Augustine Parmentier referred not only to the potato's chemical composition but also cited the fact that peasants in the Vaud viewed mixed potato breads as insufficiently sustaining. The potato's comparatively low quantity of starch in his view explained why it was not as sustaining as wheat bread, but the experiences of these peasants also demonstrated that starch was the key nutritive element.⁶¹ The body of the plebeian eater was simultaneously a site for the application of elite dietary knowledge and a source of dietary information that could not be obtained elsewhere.

VI. Vernacular Nutrition and the Crisis of the 1790s

The epistemological significance ascribed to the embodied experience of eating inevitably led learned discussion of nutrition to overlap with the vernacular languages of nourishment employed by the labourers whose eating habits were of such importance to the state. Eden himself documented the nutritional vocabulary of

⁶¹ Parmentier, *Traité sur la culture et les usages des pommes de terre*, 257; and Antoine Augustine Parmentier, *Mémoire couronné le 25 aout 1784, par l'Académie Royale des Sciences, Belles Lettres et Arts de Bordeaux* (Bordeaux, 1785), 114, 145.

the recalcitrant poor who disputed the sustaining qualities of barley breads and potato soups. ‘This is washy stuff, that affords no nourishment’, he records their saying.⁶²

Eden wrote during the hungry years of the 1790s, when repeated poor harvests, together with governmental policies favouring exports, placed Britain’s wheat supply under strain. Concerns that these shortages would weaken the population, together with anxiety over the growing number of food riots and the spread of revolutionary ideas in the wake of the French Revolution, sharpened the focus of writers both inside and outside of government on the eating habits of ordinary people. One consequence was that so-called mixed breads containing oats, potatoes, rice, barley, rye and wholemeal flour were increasingly recommended to the British poor as a nourishing alternative to white bread. In November 1795 no less than Prime Minister William Pitt urged the nation to consume such bread, which he assured MPs ‘had by *experience* been found both pleasant and nutritious’.⁶³

Eden and others recorded the responses of working people to this nutritional advice. Concepts of nourishment, and a food’s ability to sustain, not surprisingly informed the dietary practices of labourers, as indeed contemporary commentators observed. Writing to Arthur Young’s *Annals of Agriculture* from Crowcombe, in

⁶² Eden, *The State of the Poor*, i, 533. Girdler, *Observations*, 68, likewise mocked ‘the windy wash called pease–soup’.

⁶³ *Times*, 4 Nov 1795, 2 (quote, my emphasis); SR RASE B/II; Hervey, Viscount Mountmorres, *Impartial Reflections upon the Present Crisis* (London, 1796), 13–16; Sidney and Beatrice Webb, ‘The Assize of Bread’, *Economic Journal*, xiv:54 (1904); Walter Stern, ‘The Bread Crisis in Britain, 1795–96’, *Economica*, xxxi:122 (1964); Booth, ‘Food Riots’; Wells, *Wretched Faces*; and Christian Petersen, *Bread and the British Economy, c1770–1870*, ed. Andrew Jenkins (Aldershot, 1995).

Somerset, James Bernard reported in 1795, a year of widespread shortage, that ‘the principal food of the poor, hereabouts, is the whitest bread; they say, as they eat little else but bread, they must have it of the most nourishing kind’. Bernard added that potatoes were also widely consumed, and were grown in the gardens of most labourers. Resistance to washy potato soups and mixed breads thus did not reflect a blanket suspicion of such foods per se, but rather an assessment of the superior nourishment provided by wheat bread.⁶⁴ From the Dorset village of Mapperton John Wickens reported similar opinions among poor labourers: ‘they allege that as they live almost intirely on bread, they cannot perform their labour without good bread’.⁶⁵ Agricultural labourers likewise assured Young that brown bread did not allow them to work ‘with that force and heartiness which they have found to result from the finer sorts’.⁶⁶

Urban workers held similar views. Londoners, noted one baker, ‘have a foolish idea of not being able to work, with brown bread, as well as with white’.⁶⁷

⁶⁴ Arthur Young, *Annals of Agriculture and Other Useful Arts*, xxiv (London, 1795), 208. On English vernacular models of nutrition see also Muldrew, *Food, Energy and the Creation of Industriousness*.

⁶⁵ Young, *Annals of Agriculture*, xxiv, 316. See TNA HO 42/35, for many similar affirmations. Bread or flour absorbed between about forty and eighty per cent of household budgets in poor families: Petersen, *Bread and the British Economy*.

⁶⁶ Report respecting bread, corn, &c., 10 Feb. 1800, *House of Commons Sessional Papers the Eighteenth Century 1715–1800*, cxxxi, 37 (quote), House of Commons Parliamentary Papers, Parlipapers.chadwyck.co.uk.

⁶⁷ Thomas Turton, *An Address to the Good Sense and Candour of the People in behalf of the Dealers in Corn* (London, 1800), 85 (quote); and Girdler, *Observations*, 67–8.

Another observed that his customers believed that such bread ‘did not go so far as the same weight of the finer bread’.⁶⁸ Workers in Sheffield told local officials that unlike bread and meat, ‘potatoes and cabbage would not support them to go through a day’s work’.⁶⁹ Corporeal experience underpinned these evaluations, just as it did those of Stark or Eden. This is why ‘the poor round us will not eat brown bread nor will servants’, as Mary Dickenson of Birch Hall, near Manchester, complained.⁷⁰

Scholars have long recognised the importance that white bread held for urban workers, in particular, in many parts of Europe. Thompson argued years ago that the provision of white bread was considered an important part of the British state’s obligation to the populace. He maintained that the rejection by urban workers of alternatives such as potatoes reflected the low status of these substitutes, a view echoed by Catherine Gallagher and Steven Greenblatt, who highlighted the need to historicise ‘what counted as food and what felt like hunger’.⁷¹ Part of that

⁶⁸ Observations of Charles Smith on the assize of bread, 1775, Guildhall Library, London [henceforth GL], Ms 7801, box 2; and Report respecting bread, corn, &c., 10 Feb. 1800, *House of Commons Sessional Papers*, cxxxii, 17–18 (quote).

⁶⁹ *Hampshire Chronicle*, 3 Nov. 1800, 2; and Bohstedt, *The Politics of Provisions*, 204.

⁷⁰ Notebook of Mary Dickenson, Aug. 1795, f. 10, LA, DDX 274/18.

⁷¹ Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, trans. Siân Reynolds, 2 vols. (London, 1972), i, 570–1, 588–9; Thompson, ‘The Moral Economy’; Piero Camporesi, *Bread of Dreams: Food and Fantasy in Early Modern Europe*, trans. David Gentilcore (Cambridge, 1989); and Catherine Gallagher and Stephen Greenblatt, ‘The Potato in the Materialist Imagination’, *Practising New Historicism* (Chicago, 2000), 125.

historicisation must entail an understanding of the vernacular models of nourishment that informed working-class eating practices. Working people favoured white bread not because foods such as potatoes were disdained (many grew potatoes in their own gardens) nor because they wished to emulate the consumption practices of the gentry—indeed, the failure of efforts to encourage emulation was a source of considerable disappointment to successive British governments.⁷² Rather, they viewed white bread as particularly nourishing. As one London baker explained in 1767, ‘every pound of the fine flour taken is near half of it the nourishment and therefore the poor where I live prefer the fine and say the best is the best cheap’.⁷³

Christian Petersen has suggested that this was in part because of the laxative effect of brown bread. Coarse bread containing a great deal of bran was widely viewed as ‘purgative and relaxing’.⁷⁴ It was well known, conceded a Parliamentary

⁷² During the 1790s the gentry up and down the country issued public statements proclaiming their own determination to eat only wholegrain breads, in an unsuccessful attempt to convince working people to do the same. See TNA HO 42/35; and Samantha Webb, ‘Not So Pleasant to the Taste’: Coleridge in Bristol during the Mixed Bread Campaign of 1795’, *Romanticism*, xii:1 (2006).

⁷³ Mr Peacock’s Evidence as to the bread; and Mr Smith’s Evidence, both in GL Ms 7801, box 2; and Petersen, *Bread and the British Economy*, 33 (quote). Falling wheat prices in the first half of the eighteenth century helped the urban poor to access this more nutritive food: Fox, ‘Food, Drink and Social Distinction’, 180.

⁷⁴ Eden, *The State of the Poor*, I:526 (quote); Hanway, *The Great Advantage*, 10–11; and Petersen, *Bread and the British Economy*, 15–35. Advocates of wholemeal bread insisted that its laxative effects were precisely what the human system required: ‘tell me not that the laborious Workman requires substantial, strong, *costive*, finest Flour;

committee, that brown bread ‘promotes digestion too quick in proportion to its nourishment, and very often occasions fluxes, especially to those who live principally on it’.⁷⁵ The people fed at the Lingfield poor house therefore regarded wholemeal bread as ‘utterly incompetent to support them under their daily labour and as productive of bowelly complaints to them and to their children in particular’.⁷⁶ Like Cadet de Vaux, whose loose, spongy stools demonstrated the poor nutritive qualities of bran, English workers evidently regarded the production of copious bowel movements as evidence that their bodies were not extracting maximum nourishment from their meals. While the wealthier classes perhaps appreciated the effects of fibre, labourers did not.

It was not solely the poor who disputed the nutritive qualities of whole-grain breads. Eden noted with surprise that some employers were no more enthusiastic about this improved dietary because they too doubted that soups and mixed breads were sufficiently sustaining to permit a productive day’s work.⁷⁷ To be sure many landlords asserted that after trying such breads themselves, they were confident that they were, in the words of the Sussex gentleman Henry Shelley, ‘equally as

that he must be kept in the highest spirits, and live like a running horse’, sneered the author of a treatise against ‘modern luxuries’: *An Essay on Tea, Sugar, White Bread and Butter, Country Alehouses, Strong Beer and Geneva, and other Modern Luxuries* (Salisbury, 1777), 10 (my emphasis).

⁷⁵ Fourth Report, 17 Dec. 1800, *House of Commons Sessional Papers*, cxxxii, 402–3.

⁷⁶ Thomas Turton to Duke of Portland, Starborough Castle, 7 Feb. 1801, TNA HO 42/61, fol. 118. For such workers frequent visits to the toilet may also have been impractical; I am grateful to Carolyn Steedman for this observation.

⁷⁷ Eden, *The State of the Poor*, I:533.

wholesome and nutritive' as white bread. Shelley stated that as a result of his own experiments he would 'never desire to eat better bread'.⁷⁸ Others were not so certain. Writing to the *Annals of Agriculture* in 1795, the Reverend Charles Onley of Stisted, in Essex, described how to make a mixed bread using mashed potato together with wheat flour. Although he described the result as delicate and toothsome, he believed it was not so nourishing as wheat bread, and therefore could not recommend it as a food for the labouring poor. Instead he urged 'superior families' to adopt it, thereby relieving the pressure on wheat.⁷⁹ Working people, explained the Reverend David Davies in a study of the living conditions of poor labourers in various parts of Britain, 'depend almost entirely upon the bread they eat for strength to perform their daily labour. That bread should therefore be of a good kind'. Davies was certain that 'wheaten bread contains more nourishment than barley bread'. He accordingly rejected suggestions that labourers consume multi-grain breads containing barely, potatoes or other substances.⁸⁰ As the Whig politician Charles James Fox complained in Parliament, it was irresponsible to promote such breads as a staple for working people until their nutritional qualities had been determined. He urged the government

⁷⁸ Henry Shelley to Duke of Richmond, Lewes 28 June 1795, TNA HO 42/35, fols. 57–8 (HO 42/35 contains many similar affirmations).

⁷⁹ Young, *Annals of Agriculture*, xxiv, 165. Or see Girdler, *Observations*, 66–89.

⁸⁰ David Davies, *The Case of Labourers in Husbandry Stated and Considered* (London, 1795), 32–3 (quote); and Dalrymple, *The Poor Man's Friend*, 4–8. Or see Steedman, *Labours Lost*, 270–1.

to monitor not simply the national food stock, but also ‘the quantity of nourishment’.⁸¹

Fox’s call to investigate the nourishing qualities of staple foods was echoed by many others. In a treatise on the grain shortage, Viscount Mountmorres for instance stressed the importance of ‘ascertaining by chemical analysis, or medical inquiries, what are the cheapest grains, and most nutritious aliments; whether they may be barley or potatoes; and recommending them to governors of workhouses and charitable institutions’.⁸² His suggestion side-stepped the question of what sort of medical or chemical inquiry could possibly resolve this matter, given the lack of scientific consensus. Nonetheless, in 1800 the House of Commons undertook this impossible task by inviting several doctors to rank the nutritional merits of different breads. As the Committee stated, ‘a prejudice existed in some parts of the country against any coarser sort of bread than that which is at present known by the name of the ‘fine household bread’ on the grounds that the former was less wholesome and nutritious than the latter’. They therefore sought ‘the opinions of some eminent and respectable physicians on this point’. The results cast doubt on the merits of wholemeal bread, but unsurprisingly failed to identify the chemical qualities necessary for nourishment.

The naval physician Gilbert Blane, famed for his careful attention to statistics and the role of food in promoting health among sailors, stated that brown bread was probably not so nutritious as white because it tended to upset ‘the stomach and bowels’ of those unaccustomed to it. This was due to the large quantity of glutinous

⁸¹ *Times*, 4 Nov 1795; and *Parliamentary History of England, from the Earliest Period to the Year 1803*, xxxii (London, 1818), 238.

⁸² Hervey, *Impartial Reflections*, 12.

matter contained in wholemeal flour, which he suspected was the most nutritious part of the grain. Although he had been able to quantify the amount of gluten in white and wholemeal flour, he of course had no way of confirming that gluten was in fact the basis of wheat's nutritive qualities. His assessment therefore remained, as he expressed it, an opinion. The other physicians quizzed by the committee largely concurred with Blane's overall assessment, but like him they could marshal little specific evidence.⁸³ The Commons committee supplemented this enquiry with a vast array of statistical evidence about the grain supply and the effect of different milling techniques on yields, and also took evidence from London bakers, but none of this answered the question of whether white bread was truly more nourishing than brown.⁸⁴ The matter remained, as the president of the Board of Trade admitted in 1795, extremely 'uncertain'.⁸⁵

The food crises of the 1790s illustrate clearly how the eighteenth-century political economy of nutrition perforce combined the emergent science of digestion, practical efforts to assure the health of the labouring population, and the embodied nature of nutritional knowledge. The decade-long public debate over 'feeding the poor' drew on all these ideas. Ultimately, assessing a food's nourishing qualities

⁸³ Report respecting bread, corn, &c. &c., 10 Feb. 1800, *House of Commons Sessional Papers*, cxxxii, 4–13; Turton, *An Address*, 85; and Petersen, *Bread and the British Economy*, 35–6.

⁸⁴ Reports respecting bread and appendices, *House of Commons Sessional Papers*, cxxxii, 1–522.

⁸⁵ Memorandum from Lord Hawkesbury, 19 May 1795, TNA HO 42/34, fol. 387.

Doubts about the nutritive qualities of bread containing a larger percentage of bran were widespread; see for instance *Annals of Agriculture*, ix (1788), 560–82.

without taking into account the embodied experience of consumers produced a partial and unconvincing result. On what basis then could governments and individuals recommend that the poor overcome their objections to particular foodstuffs, if assessments made by the poor themselves informed the nutritional evaluations that underpinned elite dietary recommendations? The dietary opinions of the working poor remained obstinately central to the emergent science of nutrition. To be sure, this epistemic authority did not put bread on their tables. It however directed the attention of exasperated scientists and statesmen to the ‘fastidiousness of this class of people’, whose rejection of charity soups and health breads could best be countered by claims that others *did* find these foods sustaining.⁸⁶ ‘Great numbers of our fellow-subjects eat their bread much coarser than the Londoners: are they weaker? They are generally stronger’, insisted one promotional text.⁸⁷

Emma Spary has shown that during the eighteenth century alimentary expertise was shared between chemists, doctors and other nutritional scientists, and elite consumers.⁸⁸ Working people too possessed alimentary expertise, acquired through their own experiences of eating and working, which even chemists were obliged to acknowledge. At most experts could insist that they were themselves qualified to read the truths embedded in working bodies. This, after all, was what Thompson and Clark had done in their evaluations of the impact of maize and sugar-cane on the energy levels of enslaved workers. Their approach distanced the experts from the ordinary eaters, whose ability to speak for themselves became yet more tenuous and whose presence in these texts was thereby further diminished.

⁸⁶ Thomas Wilson to Home Office, Clitheroe, 8 Nov. 1800, TNA HO 42/53, fol. 189.

⁸⁷ Hanway, *The Great Advantage*, 13.

⁸⁸ Spary, *Feeding France*.

Nonetheless, they are there—ventriloquised, misrepresented perhaps, but still necessary. Prior to the elaboration of a model of nutrition based on the ostensibly objective language of calories and proteins, it was difficult to frame an argument without them.

VII. From Embodied Knowledge to Nutritional Science

Well into the nineteenth century scientists and public officials juggled the truth value of ‘science on the one hand, and daily experience on the other’ in determining food’s energy value.⁸⁹ As the decades passed the conviction that ‘the health and energy of the worker was a crucial element in a national calculus’ only deepened, as Anson Rabinbach has noted in his study of late nineteenth-century nutritional science and the concept of fatigue.⁹⁰ The conviction that healthy workers were essential to the health of the body politic took on new features with the emergence of a scientific consensus about the basic elements of human nutrition. The quantification of food’s nutritive value through the calorie and other numerical measures resonated with on-going nineteenth-century efforts to establish mathematical methods to measure work, which offered a way of linking labour outputs with food inputs. ‘Rational nutrition’, notes Corinna Treitel, thus ‘represented

⁸⁹ A. Hurel, ‘Du Régime alimentaire dans les maisons centrales’, *Annales d’hygiène publique et de médecine légale*, 2nd series, xliii (1875), 348 (quote); and Simmons, *Vital Minimum*, 46.

⁹⁰ Rabinbach, *The Human Motor*, 24.

the breakthrough of a new kind of biopolitics that regarded entire populations and their food needs as thermodynamic systems requiring constant regulation'.⁹¹

Nick Cullather has shown the powerful ability of this new language to justify large-scale programmes of dietary intervention, and to explain the inequalities that characterised the age of empire.⁹² A further effect was to excise from nutritional science the notion that individuals were in any way qualified to assess the merits of their own eating habits. The new language of calories and vitamins purported to capture in objective terms the nutritive qualities of food. As an oft-reprinted British school text explained, in a discussion of the nutritional value of grain,

starch forms a large proportion of all these plants, and you will remember how useful an article of food that is, because it contains a great deal of carbon.

Gluten is the name given to the nitrogenous parts of these plants. . . We need much more carbon than nitrogen to keep up the strength of our bodies. Try to remember that 5000 grains of carbon are required for a man, and 300 grains of nitrogen, to be taken every day.⁹³

Little room was left between these statistics and compounds for a man's own assessment of the strength of his body.

By the late nineteenth century scientific thinking had largely delegitimised self-evaluation as a source of information about dietary health. Eating was instead positioned as a scientific act. A healthy diet was one that provided optimal nutrition, a concept firmly in the grasp of trained professionals. Scientists such as Atwater

⁹¹ Treitel, 'Max Rubner', 5.

⁹² Cullather, 'The Foreign Policy of the Calorie'; and Nick Cullather, *The Hungry World: America's Cold War Battle Against Poverty in Asia* (Cambridge, 2010).

⁹³ E. Rice, *A Text-Book of Domestic Economy* (London, [c.1900]), 31.

insisted that neither the cost of a food, nor its taste, reflected its nutritive qualities. Nutritionists were uneasy about any effort by ordinary people to determine their own food regimes. Such gustatory autonomy was in their view unlikely to result in a nutritionally sound diet. Worst of all was a diet guided by personal preference, as it was likely to seduce the eater into the consumption of unhealthy and nutritionally empty foods such as the fresh vegetables whose presence on the tables of European immigrants in the United States enraged nutritional scientists. The opinions of eaters were not simply irrelevant to determining whether a food was nourishing. They were a positive hindrance.⁹⁴

This article has described the nutritional universe displaced by the late nineteenth-century rise of economic chemistry and domestic science. During the eighteenth century nutritional evidence said to derive from the bodies and opinions of labourers, slaves and other working people formed an important part of learned arguments about food's ability to nourish. Despite the immense authority accorded to quantification, and the intensive investigation of food chemistry, eighteenth-century scientists failed to establish an impersonal metric for nutritiveness. By the end of the nineteenth century, in contrast, nutrition had become a matter of scientific fact, not a form of embodied knowledge.

⁹⁴ Shapiro, *Perfection Salad*; John Coveney, *Food, Morals and Meaning: The Pleasure and Anxiety of Eating* (London, 2000); Carole Helstocky, 'The State, Health, and Nutrition', in Kenneth Kiple and Kriemhild Coneè Ornelas (eds.), *Cambridge World History of Food*, 2 vols. (Cambridge, 2001), ii; Nestle, *Food Politics*; and Biltekoff, *Eating Right in America*. On tomatoes and other wasteful expenditures see W.O. Atwater and A.P. Bryant, *Dietary Studies in Chicago in 1895 and 1896* (Washington, 1898), 20, 36.

It is tempting to suggest that the move from embodied to chemical models of nutrition parallels the shift, traced by Mitchell Dean and others, from an eighteenth-century concern with managing ‘the poor’ as a vital component of governance, towards a nineteenth-century interest in poverty as a social problem.⁹⁵ ‘Poverty’ was a condition created by irresponsible neglect of the impersonal economic forces shaping human existence; poor nutrition was caused by wilful disregard of scientifically-established dietary advice. From this perspective the principles of economics were no more subject to personal opinion or individual negotiation than were the carbon requirements of a fully-grown man. The stability of this impersonal edifice of economic and nutritional truths has long been questioned, not least by economists and dieticians themselves; it is perhaps instructive to remind ourselves of the somewhat different structures that it replaced.

⁹⁵ Dean, *The Constitution of Poverty*; Sherman, *Imagining Poverty*; and Vernon, *Hunger*.