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Science, Technology, and Management in the Middle-Class English Home,
c. 1800-1880

by

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Abstract

The nineteenth-century English middle class was strongly influenced by science, industry, and capitalist managerial techniques. These trends also made their way into the domestic space, where women negotiated their application, particularly in the kitchen. This thesis examines domestic life in the context of the popularization of science and the history of technology and management to come to a fuller understanding of how middle-class women ran their homes between about 1800 and 1880, a period of broad industrialisation and business growth. The values of fact, precision, rationality, and order influenced the practice of cookery, the physical technologies in the home, and the management of people, time, and money. The middle-class male workspace celebrated the same values; women were the domestic counterparts of their husbands. Although the prescriptive literature was not always slavishly followed, adherence to these values, both at work and at home, could help cement the family's social status.

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Introduction

“Objects and words also have hollow places in which a past sleeps, as in the everyday acts of walking, eating, going to bed, in which ancient revolutions slumber.” – Michel de Certeau¹

In 1864 John Ruskin expressed an ideology of domestic life that has come to exemplify many modern understandings of the Victorians. Home, he wrote, is the place of Peace; the shelter, not only from all injury, but from all terror, doubt, and division. In so far as it is not this, it is not home; so far as the anxieties of the outer life penetrate into it, and the inconsistently-minded, unknown, unloved, or hostile society of the outer world is allowed by either husband or wife to cross the threshold, it ceases to be home.²

Woman’s intellect, in Ruskin’s estimation, was for “sweet ordering [and] arrangement.” She was the home’s moral and emotional core, the complement to the active, adventurous, protective man.³

Ruskin’s mention of ordering and arrangement, however, hints at a second ideal of womanliness and home life. Woman was the quiet moral leader, but she was also the industrious manager of a domestic enterprise. The former figure has been thoroughly discussed by critics and historians, but the latter remained largely unstudied until the 1970s.⁴ Marxist-feminist historian Leonore Davidoff’s “The Rationalization of Housework” (1976) was one of the first works to explore how nineteenth-century women ordered their homes. Davidoff argues that boundary maintenance was a crucial reason for women’s housework. Cleaning and cooking drew distinctions between working and middle class, men and women, or outside world and home, for example. However, Davidoff also views the rationalization

of housework as limited and short-lived, and women as isolated and subordinated in their homes; she ignores much of the potential for empowerment in domestic management. Literary scholars have been more apt to explore this angle.

Elizabeth Langland's *Nobody's Angels* (1995), for instance, challenges the conventional understanding of the Victorian woman as the Angel in the House.

Rather than a haven, the home was “a theater for the staging of a family's social position” and ultimately middle-class hegemony.⁵ Monica F. Cohen's

Professional Domesticity in the Victorian Novel (1998) contends that domesticity might be read as a Weberian vocation. Her emphasis on the spiritual element of professionalism, however, is more suited to literary representations than to the real work of the kitchen. A historical approach is necessary to unearth the

specialist knowledge that governed the nineteenth-century home, but extant work on the history of domestic technology and management is largely antiquarian,

lacking solid theoretical and cultural grounding. Conversely, formal historical

studies of Victorian technology tend to ignore domestic advances.⁶ The need remains for a study of the science, technology, and management of the period's

domestic life. This thesis combines a feminist approach with literature on the

popularization of science and the history of technology and management to come

to a fuller understanding of how middle-class women ran their homes between

about 1800 and 1880, a period of broad industrialisation and business growth.⁷

An Industrial Society

Britain was a dynamic industrial nation in the nineteenth century. The number of patents filed ballooned from 92 in the 1750s to 4581 in the 1840s.⁸

When Ralph Waldo Emerson visited in that decade, he observed that

The bias of the nation is a passion for utility. They love the lever, the screw, the pulley, the Flanders draught-horse, the waterfall, wind-mills, tide-mills; the sea and the wind to bear their freight ships.... Now, their toys are steam and galvanism.... They study use and fitness in their building, in the order of their dwellings, and in their dress.... They build roads, aqueducts, warm and ventilate houses. And they have impressed their directness and practical habit on modern civilization.... The spirit of system, attention to details, and the subordination of details, or, the not driving things too finely, (which is charged on the Germans,) constitute that despatch of business, which makes the mercantile power of England.⁹

As the century progressed, industrialisation penetrated new sectors, and old crafts degraded. New technological developments like steam power, gas lighting, precision machine tools, and interchangeable parts were invented or refined, speeding up and increasing the scale and standardization of production.¹⁰ The era was symbolized by the 1851 Great Exhibition of the Works of Industry of all Nations, where the marvellous Crystal Palace also ushered in a new age of functional architecture. Nearly every part of the colossal structure was mechanically manufactured, down to the painting of the sash bars, as the Exhibition catalogue boasted.¹¹ Resistance by the likes of Ruskin and William Morris could do little against a surging tide. The nation celebrated ingenuity and invention. Artisans and entrepreneurs applied their talents to both industry and the home. As early as 1832, Charles Babbage, a Cambridge mathematician and

technology enthusiast, began his book *On the Economy of Machinery and Manufactures* by noting that “There exists, perhaps, no single circumstance which distinguishes our country more remarkably from all others, than the vast extent and perfection to which we have carried the contrivance of tools and machines for forming those conveniences of which so large a quantity is consumed by almost every class of the community.”¹² Technology’s developments were highly visible to the middle classes, not just in the context of a formal Exhibition, but also in their daily experiences. They could read about mechanical looms and travel on railways criss-crossing the nation. The *Illustrated London News*, founded in 1842, kept readers well abreast of new developments. Over the century, technology was also more widely integrated into the home. The middle class might read by gaslight or buy a mincing machine, and in 1882 the *Journal of Domestic Appliances* called the era “a regular handle-turning age.”¹³ Industry and mechanization changed their everyday lives.

Financially and organizationally behind many of these technological advances were the middle class, and the factories, machines, companies, and professions through which their fortunes were made depended on rigorous systematization. Systems themselves, in turn, are a kind of technology, which John Kenneth Galbraith has defined simply as “the systematic application of scientific or other organized knowledge to practical tasks.”¹⁴ Technology, then, is both artifact – the product of technological innovation – and process, “a means of organizing energy and utilizing resources toward some definable end,” as William and Deborah Andrews put it.¹⁵ Machines had to be perfectly sized and timed to

produce regular products and prevent dangerous accidents. Accurate timekeeping was crucial as more trains needed to be coordinated, and budding sciences like chemistry demanded careful measurements. The Imperial system of measurement was finally adopted in 1824, easing trade relations within Britain and confirming the spirit of standardization. Middle-class success was embedded in a technological society.

A key theme in Margaret R. Hunt's *The Middling Sort: Commerce, Gender, and the Family in England, 1680-1780* is the inculcation of literacy, numeracy, and rationality among boys and girls of the middling ranks.¹⁶ By the eighteenth century, as apprenticeships waned among the middle classes, schools reinforced disciplined, rational, and practical education, particularly for boys. This educational style continued to thrive among the nineteenth-century middle class. The technological society demanded order and reason. The dissenting academies emphasized science and commercial skills, while special schools were also set up for military, naval, engineering, and commercial training.¹⁷ The City of London School, for instance, was established in 1835 for "respectable persons engaged in professional, commercial, or trading pursuits." It taught modern and classical languages, as well as writing, arithmetic, mathematics, bookkeeping, geography, and history.¹⁸ The nineteenth-century middle classes also sought higher education that would satisfy their economic drives and aspirations in an increasingly competitive commercial and technologically driven world. Oxbridge was prestigious, but it had religious requirements and had ignored the sciences, so University College London was founded in 1826 to teach literature and science at

a moderate expense.¹⁹ The school had a chair of Chemistry from the beginning, followed by a chair of Civil Engineering in 1840 and Practical Chemistry in 1844.²⁰ The rival King's College opened in 1831, and its practical and scientific inclinations were clear. The college's museum featured Babbage's Calculating Machine, as well as George III's collection of Mechanical Models and Philosophical Instruments.²¹ King's also set up a practical department of Manufacturing Art and Machinery, as well as Land Surveying and Levelling.²² In 1836 the University of London united these schools into an establishment for the sons of the middling sorts, who would soon be pursuing courses in law, architecture, civil engineering, and medicine. The Royal College of Chemistry (1845) and Royal School of Mines (1851) spoke directly to England's industrial needs in the face of heavy German competition.²³ Following the Great Exhibition, Lyon Playfair spoke at the foundation of the School of Mines, warning that "As surely as darkness follows the setting of the sun, so surely will England recede as a manufacturing nation, unless her industrial population become much more conversant with science than they are now."²⁴ Babbage concurred that science was crucial to the advancement of manufactures, and opined that manufacturers' sons would be among the next generation's greatest scientists.²⁵

Self-education was particularly important, too, for both the wealthy and the less well-off. There was a growing popular culture of science, even as its formal practice was becoming more specialized and out of the reach of amateurs. One historian has determined that the number of commercial science journals grew from five in 1815 to over eighty in 1895.²⁶ Science was also increasingly

thought to have relevance to “the truth of things,” and the enthusiastic reading public wanted to know what it had discovered about their lives.²⁷ Thus, writes Barbara T. Gates, the

Victorians located science in many places, not just in the laboratory, or in the rooms where scientific theory was debated by members of learned societies, or in the texts written by the scientists themselves. Large and small public lectures and scientific demonstrations, textbooks, atlases, dozens of popular magazines and pamphlets, and even the literature of science fiction provided hosts of learners with insights into the discoveries of science.²⁸

In their discussion of work on the history of the popularization of science, Roger Cooter and Stephen Pumfrey similarly suggest that historians of science must “be responsive to a greater plurality of the sites for the making and reproduction of scientific knowledge.” This calls for a greater scrutiny of “popular prose and non-scientific texts for (or as) signs of orthodox and unorthodox scientific authority.... [H]istorians need to explore synchronically and diachronically the careers of various scientific metaphors within popular writing and culture generally.”²⁹ Chapter 1 of this thesis in particular answers this call by looking more closely at cookbooks and household management guides for evidence of scientific understanding, while chapters 2 and 3 examine technology and its metaphors in household management.

As early as the turn of the nineteenth century, champions of women’s scientific knowledge could be found among writers of both sexes. Priscilla

Wakefield, for example, a Quaker woman with a strong interest in natural history, advocated in 1798 that female education include “geography, chemistry, electricity, botany, an investigation of the properties and habits of the several orders of animals, [and] gardening.”³⁰ Through the nineteenth century, girls were encouraged to learn about science through periodicals and books, and many women taught science to children and others with little technical knowledge, as well as “those who were scientifically literate but uninformed about specialist findings.”³¹ Women also, as will be shown in chapters 1 and 2, took an interest in the domestic relevance of scientific discoveries. Even servants had exposure to science, or were at least encouraged to turn to it for their self-improvement. The 1843 *Servant’s Magazine* featured an article on the Royal Adelaide Gallery of Practical Science, which promoted the arts and manufactures in connection with science through lectures and displays of such objects as steam guns, safety lamps, and water filters.³² The Mechanics’ Institutes also taught scientific knowledge as a means to moral self-improvement and national progress.

This culture of science and education also supported specialization, leading to the emergence of what historian James Walvin has called “an unmistakable professional ideology in a wide range of middle-class occupations.” A commitment to merit, the valuing of ability over blood, was central to this ideology.³³ In tracing technical and specialized knowledge in the nineteenth-century home, it becomes clear that women, too, were increasingly driven to take professional approaches to housekeeping, approaches that distinguished them as a class and made them the rational and well informed domestic counterparts of their

working husbands. When Isabella Beeton declared that “As with the Commander of an Army, or the leader of any enterprise, so it is with the mistress of a house,”³⁴ she was calling upon the same system of education, effort, and merit that underpinned success and authority in the world of work – even if she did not receive the same rewards. Margaret Posonby has identified a huge increase in advice literature in the first half of the nineteenth century, and the sixty thousand copies that Beeton’s book sold in its first year speak to the continuing needs and values of middle-class Britons in a rapidly urbanizing and industrialising society.³⁵ They sought guidance in system and fact that would separate them from their inferiors both at work and at home.

The Middle Class

Altogether the middle class may have only made up a small proportion of British society in this period, perhaps somewhere between 15 and 25 percent,³⁶ but its cultural impact was massive. This politically and economically powerful group feverishly produced and voraciously consumed print and commodity culture, much of which survives today for the historian’s perusal. This class is the focus of this thesis, particularly those members in expanding urban areas like London. But historians have long disagreed about how to define such a protean social group. Some have separated the middle class from those below by their ability to keep one or more servants, as Seebom Rowntree did in 1901, or at least three servants, or by the fact that the principal breadwinner did not have to perform manual labour.³⁷ Separating them from those above, the middle class needed to generate income from work rather than land, but they possessed

property, whether mobile capital, stock in trade, or even professional credentials. They also managed resources and people.³⁸ In his 1868 study of the national income, R. Dudley Baxter provided a list of occupations that constituted upper and middle class: all persons of rank and property, officers, agents, learned professions, mercantile men, dealers, tradesmen and persons who buy or sell, owners, superintendents, collectors, foremen, measurers, clerks, and shopmen, as well as a fraction of police, widows, farmers and graziers, farm bailiffs, masters and mistresses, those in animal and vegetable food, and drinks and stimulants.³⁹

Other studies focus on income ranges, but their estimates of a middle-class income can extend from under £100 per annum to over £1000.⁴⁰ Indeed, income for many of the occupations listed above could be well under £100; the average income for a business clerk in Manchester was perhaps £60 in 1860.⁴¹ When income tax was introduced in 1802, it began at £50, a base level of gentility. When it was reintroduced in 1842, it commenced at £150, reduced to £100 in 1853.⁴² Of those who paid taxes, 81 percent were in the £100 to £300 range, and 14.3 percent in the £300 to £1000 range.⁴³ Most of the middling sorts were not very rich, but they shared a set of economic and social values, and the combination of income, occupation, and lifestyle could give – then as now – a general impression of social standing. Class boundaries, however, were blurry, and their delineation and reinforcement constitute a major nineteenth-century project. Potential membership and ascension in the middle class over the eighteenth and nineteenth centuries were largely based on trade and manufacturing wealth, so it is only logical that members of this group would turn

to the values behind these industries to define their status, even in the home.⁴⁴

This thesis looks in particular at the rise of science and technology and the importance of commercial and industrial management in the domestic space. The home, and especially the kitchen, the central arena for household management and work, mirrored trends that dominated the broader society.

Chapters

In order to study this domestic space, this thesis draws heavily on household management guides and cookbooks, as well as letters and life writing, fiction, essays, technological treatises, and even travel narratives. Household manuals and cookbooks are particularly challenging sources. They concentrate on theory rather than praxis, on perfection rather than reality. However, in their hortatory way, these guides often reference or express a contrast to the less-than-ideal practices of nineteenth-century wives and servants. Their great popularity, moreover, indicates the reality of these domestic *ideologies*. Even if advice books were not exactly obeyed by all women, they deserve to be studied as ideals.

Chapter 1 looks in particular at how cookery became increasingly technical over the nineteenth century. The kitchen was no longer an intuitive space, but a scientific laboratory where women followed authoritative instructions. Chapter 2 examines the physical technologies that made their way into the home, and their relationship to industrial technologies. It focuses especially on coal-fired ranges, gas, plumbing, and systems of communication. The home was the target for technological advance, and it was strongly connected to serious places of work, although tools, machines, and methods took on new

meanings in the domestic space. Chapter 3 pursues this idea further, exploring how, at the level of the ideal, household management shared many characteristics with industrial and commercial management. This was true of labour relations, the ordering of time and things, and budgeting. This management had an uneasy relationship with femininity. Sometimes it supported traditional morality, and sometimes it stood in apparent opposition to women's supposed passivity. However, through their household governance, as through their applications of science and material technology in the home, middle-class women reinforced societal power relations that defined their status. All three chapters also indicate that science and industrialisation changed attitudes toward and perceptions of the home and its work, penetrating the most private of social spaces.

The separate spheres are in some ways a fiction. Women's work in the home had strong ties to traditionally masculine science, industry, and commerce, and it reinforced the family's public social status. Still, Thad Logan, historian of the Victorian parlour, argues that while "homes did not and could not exist as transcendent spaces outside economic and political systems, the sequestration of women in the home was real enough, and compulsory domesticity was the context of life for middle-class Victorian women."⁴⁵ She may be overstating her point, since work on female retailing and enterprise by historians such as Alison Kay and Hannah Barker seriously challenges the idea of female imprisonment.⁴⁶ But even those women who worked had to manage a home, and many middle-class women were full-time mistresses, raising the important question of what they did in their domestic lives. The following work offers the beginnings of an answer.

Chapter 1: The Scientization of Cookery¹

“‘Instinct is very good,’ said Miriam, ‘but reason is better.’” – Julia M. Wright²

Introduction

In the preface to his 1869 household manual, *The Reason Why: Domestic Science*,³ editor R.K. Philp muses over a probably imagined childhood kitchen:

I can tell the very spot where, over the mantelpiece, hung large and small graters, corkscrews, a pyramid of ladles, the flour-dredge, and pepper and spice boxes of various sizes, with cups, moulds, strainers, and other apparatus essential to the manipulations of Owley’s laboratory; and I well remember the old-fashioned silver watch, round as a turnip, whose black hands kept time as accurately as the electric clock, and between whose workings and my appetite there existed a mysterious sympathy. There are many domestics whose motto seems to be, “A place for everything, *and nothing in its place*,” but it was otherwise with Owley, and hence, though some forty years have rolled away since I looked upon that once familiar scene, I vividly see Owley surrounded by all the emblems of her science each in its exact and proper position.⁴

To the trained gaze of a curious middle-class Victorian boy, the kitchen is a potential laboratory, the site of a mysterious but rule-based culinary science. But when he asks Owley why the bread rises or why the spoon distorts his face, the kind but ignorant woman does not know. Philp reflects, “it had never occurred to her before that such things *might be asked*.”⁵ Women of Philp’s generation, however, have access to new knowledge, and he determines to provide

“illustrations of scientific principles which bear upon the Housewife’s duties; so that she may not only know that she should do a thing, but WHY she should do it, and, knowing why, perform it all the more effectively and willingly.”⁶

The introduction discussed the increasing popularity of science and technology in nineteenth-century Britain, an era that at least one historian has called “the Age of Science.”⁷ This widening culture of science was partially open to the middle class. Popular science periodicals encouraged amateur scientific activity, and men might contribute to scientific societies, participating in “low scientific” culture.⁸ However fictional, the “image of the Republic of Science constantly invoked,” as Susan Sheets-Pyenson puts it, “required that its members possess neither special education nor natural endowments, but simply an eagerness to collect facts from everyday experience that might contribute to scientific progress.”⁹ Women were included in much of this scientific fervour. Humphry Davy thought that women should learn science and transmit it as part of general education, and his lectures at the Royal Institution were extremely popular with women.¹⁰ Science also appeared in domestic miscellanea for less elite women, and Philp identified scientific authors of “celebrity” who had turned their attentions to the home: his readers might recognize food chemists Justus von Liebig and Michael Donovan, as well as Dionysius Lardner and James F. Johnston, who examined the chemistry and physics of daily life.¹¹

In their review of studies of the popularization of science, Roger Cooter and Stephen Pumphrey argue that historians have too often used a “diffusionist model,” in which popularization is static. “Inherent is a notion of cultural lag

But this is not necessarily the case, nor should popularization necessarily assume dilution.” The two argue instead for a new model, framed not in terms of dilution or colonization, but rather “grafting, appropriation, and transformation.” Popular science may oppose elite science, or elite science in popular hands may take on an unpredicted form.¹² This chapter looks more specifically at cookery to determine how science was manifested in middle-class homes. A crucial development in nineteenth-century domestic management was the application of “male” scientific knowledge to a space typically regarded as female. Though they still competed with strong customary practices, scientific interests and values became more central to cookery, and women took some control of this technical knowledge. Owley’s art was recast as domestic science.¹³ While critics and historians have long examined women’s moral prerogative in the home, this chapter looks more closely at the scientific prerogative.

Quantification and Precision

From the late sixteenth century through the nineteenth, the number of new cookbook titles published shows a clear growth trend.¹⁴ Whether women relied on these books or not, their popularity proclaims English society’s conviction in their usefulness and a changing approach to household work from the early modern period onward. A cookbook, a printed reference and instruction book, implies order, rationalization, and demystification. The once-informal oral transfer of information, sometimes supplemented by the recording of an occasional recipe for personal use, became a process of official instruction as single authorities enforced a proper mode of cookery. Of course, women continued to produce their

own manuscript cookbooks, often containing recipes passed through generations and between families and exemplifying female community, but over time even these became less personal and relied increasingly on printed authority. In one family receipt book, kept in various hands from about 1750 to 1900, early receipts like “To Pickle Walnuts Mrs Golding’s Way” give way by the last pages to recipes copied out of, or even pasted directly from, newspapers.¹⁵

A closer study of published cookbooks also reveals an increasingly scientific attitude to cookery. As early as 1730 authors referred to cookery as a “system,” a term that became more frequent through the eighteenth and nineteenth centuries and implied an orderly, rationalized approach to a complex set of information and processes.¹⁶ Two key examples of rationalization were timekeeping and accurate measurements. The timekeeping recommended in such books could be extremely precise, assisted by the now nearly ubiquitous practice of keeping of a kitchen clock. In *The New Experienced English House-Keeper* (1795), for example, Sarah Martin declared that a lobster must be boiled “eight minutes if large, if small six minutes.”¹⁷ The quarter-hour chimes of the local public clock were insufficient; each house would now need an accurate timepiece for kitchen use. A comparison of two editions of Hannah Glasse’s popular *Art of Cookery* also shows more specific cooking times over the course of the eighteenth century. In the 1747 edition, Glasse advised that for wild ducks “Ten Minutes at a very quick Fire will do them; but if you love them well done, a Quarter of an Hour.” For “Teal, Wigeon, &c.” she noted that cooks must “Observe the same Rules,” while woodcocks, snipes and partridges take twenty minutes.¹⁸ In the

1799 edition, however, widgeon is a quarter of an hour, teal is eleven or twelve minutes. Woodcocks are twenty-five minutes and partridges and snipes are twenty.¹⁹ While in the mid-eighteenth century Glasse could group together similar birds with the knowledge that the cook would use her judgment, by 1799 the cookbook assigns itself greater authority. The increased availability of the clock, moreover, meant that meals were no longer just poorly or over-cooked. They were *ill-timed*, implying a lack of order and calculation. One cookery book of the 1820s, for example, explained that “In a well regulated family, all the Clocks and Watches should agree; on this depends the fate of the Dinner; *what would be agreeable to the Stomach, and restorative to the System, if served at TWO o’clock, – will be uneatable and indigestible at A QUARTER PAST.*” The cook’s judgment and instinct were reduced to analysis: “She will calculate to the minute the time required to roast a large Capon or a little Lark, – and is equally attentive to the degree of heat of her Stove, and the time her Sauce remains on it – when to withdraw the Bakings from the oven, the Roast from the spit, and the Stew from the pan.”²⁰ This was a new epistemology, a new way of understanding an ancient skill. The time-discipline associated with commerce and industry also existed at home. The clock influenced both male and female work-rhythms.²¹

Not only was time increasingly quantified, but there was also an uneven trend in the nineteenth century toward precision in ingredient measurements, which demands basic arithmetic, fractions, and ratios.²² Earlier recipes commonly measured only a few basic items. A mid-eighteenth-century manuscript recipe for Oxford Puddings, for instance, advised the cook to “take half a Penny Loaf grate

it & put to it half a pound of Currants, half a pound of Beef Suet minced Small one Nutmeg, a little salt as much Cream & Eggs as will make it almost as stiff as Paste.”²³ A printed recipe for wigs (a kind of bun) from 1795 was similar, calling for two pounds of flour and a quarter of a pound of butter, but “as much new milk as you think will mix the flour.”²⁴ Although measures were used for liquids, they tend instead to be given – and more specifically – for dry ingredients, probably facilitated by the purchase of such ingredients by weight. Kitchen scales are present in some eighteenth-century probate inventories, but the cook probably still estimated a great deal, as evidenced by the fact that household guides continued to encourage the use of scales a hundred years later.²⁵ As Maria Rundell reassured her readers in 1808, “though the quantities may be as accurately directed as possible, yet much must be left to the discretion of the person who uses them.”²⁶

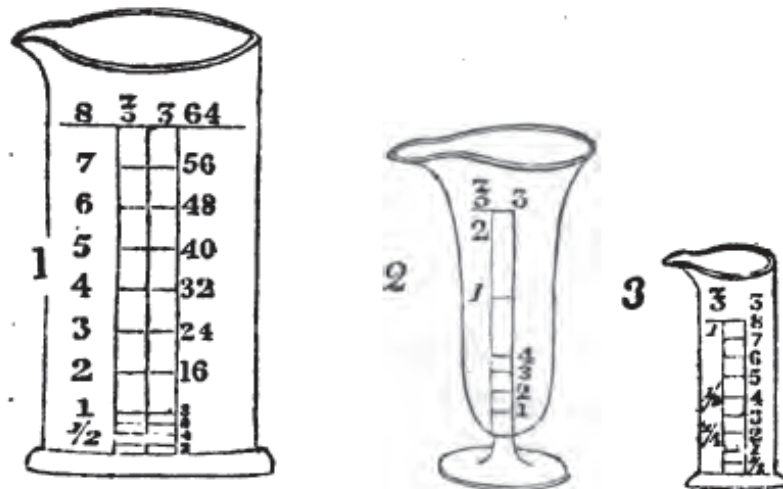
A decade later, however, William Kitchiner’s *The Cook’s Oracle* (1817) would be giving quite different advice, insisting on “reduc[ing] our culinary operations to as exact a certainty as the nature of the processes would admit of” and declaring it “a precision never before attempted in former cookery books.”²⁷ Although Kitchiner directed his book squarely to women young and old, experienced and neophyte, of “the middle ranks of society,” his interest in measurement was probably grounded in contemporary public thought.²⁸ Simon Schaffer writes that “In Victorian Britain, exact measurement was advertised as a vital accompaniment of commercial, military, and thus imperial triumph.”²⁹ Measuring has also been studied in the context of eighteenth-century formal science, where, as Kitchiner would have observed, it was generally increasingly

valued.³⁰ The son of a coal merchant, he styled himself a medical doctor and also studied optics; he was elected to the Royal Society in 1819. His book, in fact, bore the stamp of this higher scientific authority: “The Editor has been materially assisted by Mr. Henry Osborne, the excellent cook to the late Sir Joseph Banks; that worthy President of the Royal Society was so sensible of the importance of the subject the Editor was investigating, that he sent his cook to assist him in his arduous task.”³¹ Although *The Cook’s Oracle* was meant to be accessible without formal training, free of jargon or excessive detail, this flirtation with officialdom points to Kitchiner’s use of science to attract female readers. The title page of the first edition emphasized that the “Quantity of each Article [was] Accurately Stated by Weight and Measure” and that the receipts were “the Result of Actual Experiments Instituted in the Kitchen of a Physician.” The kitchen was now a laboratory and recipes the result of repeatable empirical testing, the same criteria of replicability and credibility that defined the high sciences.³²

Kitchiner used the apothecaries’ system of weights and measures, using drachms in particular as a measure of salt, spices, and other minute ingredients. While this system was not unusual in eighteenth-century receipt books, it was usually limited to medicinal receipts or related items such as lavender water. Kitchiner, however, expanded its use: his recipe for Stuffing for Hare, for example, recommended “parsley a drachm, [and] shallot half a drachm.”³³ Kitchiner sometimes used tea- and tablespoons, too, which could be understood to have precise meanings and medical uses as well. As Mrs Beeton pointed out, “A table-spoonful is frequently mentioned in a recipe, in the prescriptions of medical

men, and also in medical, chemical, and gastronomical works. By it is generally meant and understood a measure or bulk equal to that which would be produced by half an ounce of water.”³⁴ Kitchiner stated that any cook “who wishes to be regular in her business” have “measures divided into tea and table Spoons” or drachms and ounces, and named a glass warehouse where they might be purchased.³⁵ Such graduated glasses were typically reserved for apothecaries (see fig. 1.1). Beeton gave similar advice over forty years later, suggesting that women buy graduated glasses at the chemist’s or make their own by “weighing the water contained in any given measure, and marking on any tall glass the space it occupies.”³⁶ Both Kitchiner’s and Beeton’s suggestions were probably too ambitious for most women, but medical and scientific principles were the ideal. Historian Theodore M. Porter calls quantification a “social technology”; here it is evident that a system of sensory evaluation privileging the cook’s judgment was to give way to the total abstraction of measurement.³⁷

The Cook’s Oracle sold seventy thousand copies in England between 1817 and 1829, sowing scientific seeds that would soon come to fruition.³⁸ In 1845, after years of supposed research and testing, Eliza Acton’s *Modern Cookery in all its Branches* was published. Priced at 7s. 6d. and dedicated to “the Young Housekeepers of England,” the book was for the middle classes, and probably those who had poorly trained servants or did much of their own cookery. Acton, therefore, like Kitchiner, paid close attention to detail in her recipes. Her major innovation was that she followed each recipe with a quantitative summary: a list of ingredients and their weights or measurements, as well as the precise cooking



No. 1. represents a glass, calculated to measure any quantity from two drachms to eight ounces.

No. 2. From one drachm to two ounces.

No. 3. From half a drachm to one ounce.

Note.—Sixty drops or minims make one drachm.

• A common tea-spoon will be about a dram, 4 tea-spoonful, a table-spoonful, and 4 of the latter will be about a common wine-glassful.

Figure 1.1: Measuring Glasses. From Samuel Adams and Sarah Adams, *The Complete Servant* (London: Knight and Lacey, 1825), 213. Google Books.

time. “This shows at a glance,” she enthused, “what articles have to be prepared beforehand, and the hour at which they must be ready; while it affords great facility as well, for an estimate of the expense attending them.”³⁹ Her schematic format assisted in orderly and quantitative budgeting, marketing, and scheduling.

Of course, Acton still resorted to personal judgments about the difference between a small and large cupful, for example, just as Kitchiner was not above the “small tablespoonful of flour.”⁴⁰ Both books, however, illustrate the quantitative shift in cookery. By mid-century, nearly all cookbooks gave more or less precise measurements for each ingredient, although drachms had lost out to teaspoons and tablespoons. In part, this precision may relate to the stabilization of food quality, but it also indicates a desire for reliability and consistency, which aided in management and budgeting as well as taste.⁴¹ The spirit of quantification is also evident in the shift from numbers in text to figures. Manuscript cookbooks suggest that the process was slow and uneven through the eighteenth and early nineteenth centuries, but figures were engrained in Acton, and one midcentury text even drew their use to the reader’s attention. *Murray’s Modern Cookery Book* (1851) boasted that one of its “novel features” was “the mode of printing in figures all numbers and quantities for the sake of clearness,” a change that was to “contribute much to the utility of the work and to facilitate the use of it.”⁴² Other texts numbered their receipts as well, adding to their schematic format.⁴³

In the late 1850s, Beeton made another quantitative leap. She followed Acton’s lead in including tidy summaries of ingredients and cooking times, but she presented her recipes even more schematically, breaking them into

ingredients, mode, time, average cost, seasonableness, and number of portions. Logically, the ingredients preceded the instructions, an arrangement other books had already tried but in a less simplified form.⁴⁴ Beeton's format was also a crucial step in the evolution of recipes from a narrative paragraph to an accounting-style list. This evolution, too, was uneven, but well established by the end of the century. A late eighteenth or early nineteenth-century receipt for seed cake in one manuscript cookbook, for instance, was in paragraph form:

Put 18 Eggs a pint of Rose Water, beat em very well, with a Whisk, then put 3 lb of white Sugar beat it well in, then put in 3 lb of Flour, & as many Seeds as you think proper, beat em all together till well mixed. Let your Oven be very hot, (to colour it) Let it bake, an hour at least.⁴⁵

By 1885, however, a plum pudding sauce recipe was structured quite differently:

1/4 lb of Fresh butter
1 Lemon
1/2 lb Castor Sugar
1/2 Glass Brandy
1/2 oz Sherry⁴⁶

Although paragraph forms did persist, manuscript cookbooks illustrate the extent to which women had internalized the systems of order and regulation.

Other books indicate that information once given in the text was now listed in tables. The *Encyclopedia of Domestic Economy*, for instance, included an "Allowance of Time for Cooking Processes" table; Kitchiner, by comparison, had simply suggested readers "follow the old general rule of allowing *rather more*

than a Quarter of an hour to the Pound,” although he was frustrated that roasting depended so much on the cook’s practice and observation.⁴⁷ Such tables were a gradual development: the 1828 *Cook and Housewife’s Manual* did not include a summary table for cooking times, but the 1847 edition did.⁴⁸ Fact was celebrated above narrative in the kitchen.⁴⁹ The specialization of cookery required not only quantification and equipment, but also clear reference knowledge.⁵⁰

Chemistry and Medicine

Complementing these shifts in cookery was the diffusion of scientific knowledge, facilitated by the developing triadic relationship between doctors, chemists, and cooks. The history of popular dietetics is understudied, but it is clear that by the early nineteenth century, Hippocratic principles had been largely dismissed. Medical treatises, however, reveal a continuing empirical interest in food and health. William Cullen’s *Treatise of the Materia Medica* (1789), for instance, dealt with both aliments and medicines, thoroughly classifying the former and their modes of preparation on the basis of nutritive qualities. Medical doctor William Nisbet’s *A Practical Treatise on Diet* (1801) went further, arguing that “in chronic diseases, it is obvious that the chief means of cure consist in the proper regulation of diet alone.”⁵¹ Such sentiments continued well into the nineteenth century, as doctors emphasized the central role that the stomach played in regulating health: “no man can be a good physician who has not a competent knowledge in Cookery” was a common refrain.⁵² Proper cookery was central to health, and Nisbet went so far as to call it “dietetic chemistry.”⁵³ Kitchiner, too, declared that his precision and plain writing were necessary for the achievement

of his goal: good health through food.⁵⁴ “If medicine be ranked among those arts which dignify their professors, *cookery* may lay claim to an equal, if not a superior, distinction; to *prevent* diseases is surely a more advantageous art to mankind than to *cure* them.” His book was the “Analeptic part of the Art of Physic.”⁵⁵ Kitchiner empowered the woman as domestic physician, comparing his recipes’ precise weights and measures to “pharmaceutic prescriptions.”⁵⁶ She was the “*kitchen-doctress*,”⁵⁷ but two traditional domains of female responsibility – cookery and healing – now relied on male authority. Indeed, medicinal receipts were increasingly removed from cookery books in the eighteenth and nineteenth centuries, corresponding to the rise of medical professionalism, however contentious. Those that remained were generally on the authority of physicians.⁵⁸

Chemistry, too, was undergoing crucial developments in this period, as many universities for the first time established separate professorships for this branch of science, often filled by trained physicians with a passion for the laboratory. Doctors celebrated the fact that the chemical-physiological functioning of their remedies might be understood and improved, and some noted chemists, like physicians, turned their attentions to food and nutrition.⁵⁹ In the 1820s, for instance, London chemist and physician William Prout analysed milk into its component parts.⁶⁰ Chemistry, as historians have noted, was also a *popular* science in the early nineteenth century, offering basic explanations of the physical world, and one correspondent to *The Chemist* in the 1820s applauded its accessibility: “the profoundest of the English chemists discards the fopperies of apparatus, and keeps his laboratory within the compass of a tea-tray; a few glass

tubes, a blowpipe, some twenty little phials, and three or four wine glasses, suffice for his experiments.”⁶¹ With “Philosophy in a vinegar cruet! science in a salt cellar!,” the kitchen was literally a laboratory.

Popular texts made chemistry available to both men and women readers. Jane Marcet’s *Conversations on Chemistry* (1805), originally written to supplement Davy’s lectures, became, as one historian has put it, “the flagship for popular chemical education during the next half-century,” with over twenty thousand copies in sixteen official editions.⁶² The book catered to female readers’ supposed interests, including nutrition and cookery, as well as applied chemistry and “the rapid socio-economic changes associated with the burgeoning chemical industry.” Its woman instructor exemplified efficiency and “expound[ed] sensible views on disciplined study methods as well as the seemly behaviour of female chemists.”⁶³ Chemistry, properly manifested, was suitable for the female sphere. Frederick Accum, an operative chemist living in London, also published *Culinary Chemistry* (1821), following several other books, including *Chemical Amusement* (1817), a collection of experiments to be performed at home.⁶⁴ In *Culinary Chemistry*, Accum presented the principles behind English modes of cookery, as well as some broader philosophical questions about diet. The book’s purpose was “to enable the reader to understand the chemical principles, by means of which alimentary substances are rendered palatable and nutritious.” Accum insisted the subject was not frivolous, since, “it is by the application of the principles of philosophy to the ordinary affairs of life, that science diffuses her benefits, and perfects her claim to the gratitude of mankind.” Good cookery, he continued,

is, undoubtedly, a branch of chemistry; the kitchen is a chemical laboratory; all the processes employed for rendering alimentary substances fit for human sustenance, are chemical processes; and much waste of the materials, as well as labour to the parties, might often be spared, were those who practise this art, acquainted with some simple chemical truths which invariably would lead to certain results.⁶⁵

This “laboratory” metaphor is significant. Visual representations of the two spaces reinforce the parallel with similar equipment and layouts (see figs. 1.2 and 1.3). As Accum put it, “the boilers, stew-pans, and cradle spit of the cook correspond to the digestors, the evaporating basins, and the crucibles of the chemist.”⁶⁶ In fact, he was right. The steam digester, the forerunner of the modern pressure cooker, was originally developed by French physicist Denis Papin for extracting fat from bones. It became a standard in eighteenth and nineteenth-century chemical and physical laboratories, and by the mid-nineteenth century, a version of the apparatus was widely available in the home for the making of soups from food scraps. Cookbooks in the 1880s continued the metaphor: “The great Professor Fresenius advises the students in a chemical laboratory never to stand idle a moment, but to be always doing something in furtherance of the work they have in hand, as by intelligently conducting several operations concurrently The same advice may be given to cooks.”⁶⁷ The laboratory metaphor was perhaps as much a matter of the morality of focused work as chemical principles.

This diffusion of chemical and scientific information was, of course, uneven, but lay writers increasingly realized the appeal of scientific authority and



Figure 1.2: “A Design for a General Laboratory.” By Cornelius Varley, engraved by A.W. Warren. From Samuel Parkes, *The Chemical Catechism*, 10th ed. (London: Baldwin, Cradock, and Joy, 1822), frontispiece. Edgar Fahs Smith Collection, University of Pennsylvania Libraries.



THE KITCHEN.

Figure 1.3: A Victorian Kitchen. From *A Lady, Murray's Modern Cookery Book* (London: John Murray, 1851), [xxix]. Google Books.

picked up the culinary slack left behind by popular chemists. Marie-Antoine Carême, George IV's French chef, informed by contemporary chemistry, argued for slow stewing, "disengaging that portion which chemists term 'osmazome,' and which imparts flavour to the flesh – thus both rendering the meat tender and palatable, and the broth relishing and nutritive."⁶⁸ Some of these more scientifically oriented cookbooks were reviewed in medical publications such as the *British Medical Journal* and the *Lancet*, confirming the triadic relationship between chemistry, medicine, and cookery. Lay reviewers, too, appreciated their efforts. A review of Eliza Melroe's *An Economical and New Method of Cookery* (1798), for example, noted approvingly that "there is somewhat about chemistry and medicine in the work"; Melroe in fact referenced Cullen and some of his divisions of food constituents, simplifying them into oil, jelly, mucilage and sugar.⁶⁹ Another reviewer endorsed *Domestic Management* by "a Lady," who was said to be a follower of physician-cookbook writer Alexander Hunter and to have had the assistance of a physician for her section on food and diet.⁷⁰ At the same time, old-fashioned cookbooks increasingly faced criticism. Samuel Johnson criticized Glasse's errors in chemistry, and an 1817 review in *Blackwood's Edinburgh Magazine* disparaged both Glasse's and her rival Mrs MacIver's "extremely unscientific" want of precision.⁷¹ Though women had long cooked without them, and though they would continue to compete with customary, regional, familial, or simply experiential habits, precision and scientific knowledge were the new signs of culinary authority, and would remain so through the century.⁷² In many books, "Analytic, or Intellectual Cookery" was the aim.⁷³

Cooks were increasingly reminded to “always think,” while at least one handbook of household science, complementarily, was devoted in large part to “Aliment.”⁷⁴

The public’s devotion to chemical ideals was made clear in 1851, when Acton’s book was re-titled *Modern Cookery, For Private Families, Reduced to a System of Easy Practice, in a Series of Carefully Tested Receipts, In which the principles of Baron Liebig and other Eminent Writers have been as much as possible applied and explained by Eliza Acton.*⁷⁵ This was now no ordinary collection of receipts, but a translation of chemical principles into domestic practice. The title, surely meant to attract readers, suggested that Acton’s book was strongly influenced by the work of Justus von Liebig, a professor, laboratory scientist, and founder of the world’s first major school of chemistry at Giessen. A charismatic figure, Liebig had ties to the British Association for the Advancement of Science, mentored over fifty British pupils, and received exposure in such influential fora as the *Times* and the *Lancet*. Especially popular were his short and relatively accessible *Familiar Letters on Chemistry* (1843) and *Researches on the Chemistry of Food* (1847). Though science and practice have invalidated much of his work, his influence on scientific attitudes toward cookery was undeniable.⁷⁶

The preface of Acton’s book now emphasized “rational and healthful” cookery, appealing to the relationship between diet and health and the importance of work by Liebig and other “eminent writers.”⁷⁷ The title page also included an epigraph from Dr William Gregory, a professor of chemistry at the University of Edinburgh and the editor of Liebig’s *Researches*. The quote is from one of his footnotes: “It is the want of a scientific basis which has given rise to so many

absurd and hurtful methods of preparing food.”⁷⁸ That a cookbook would attempt to attract women with a reference to contemporary chemical developments is a sign of the diffusion of scientific interest, or at least scientific celebrity. Indeed, although Acton proclaimed devotion to and interpretation of chemical principles, Liebig’s book was one of her few technical sources, and aside from instructions for searing roasts and the “scientific boiling” of meat, her recipes were, in fact, mostly the same.⁷⁹ The chemistry was largely limited to the preface, and Acton applied professional advice unevenly. She even corrected Liebig’s instructions for Extract of Beef, his specialty for invalids: “Professor Liebig [*sic*] directs even less [boiling] time than this,” she noted, “but the soup then occasionally retains a raw flavour which is distasteful.”⁸⁰ Similarly, she ignored Gregory’s warning against “the very common English practice” of boiling meat and vegetables in large quantities of water and thus draining them of their nutritive contents.⁸¹ Acton’s devotion to chemistry and subordination to male authorities was superficial.

Still, Acton’s book, even in its earlier editions, was reviewed positively in the *Medical Gazette* and the *Medico-Chirurgical Review*, and the *Pharmaceutical Journal* stated that it succeeded Kitchiner’s work on “the science of cookery.”⁸² The reviewer also recommended it “as a complete treatise on a science, which, if not allied to Pharmacy, is unquestionably, a valuable auxiliary,” while a list of the publisher’s works of “Medical, Surgical, and Scientific Literature” catalogued Acton’s book under “Chemistry & General Science.”⁸³ The kitchen housed a scientific treatise. *Modern Cookery*’s runaway popularity, with fourteen editions by 1854, also indicates that a wide set of readers was growing comfortable with

more scientific, schematic formats. Acton herself saw her book as fitting the “present age ... of rapid and universally progressing knowledge” in which, nothing which is really calculated to advance either the great or *the small* interests of society is now regarded as too homely or too insignificant for notice. The details of domestic economy, in particular, are no longer sneered at as beneath the attention of the educated and accomplished; and the truly refined, intelligent, and high-minded women of England have ceased, in these days of comparative good sense, to consider their acquaintance with such details as inconsistent with their dignity, or injurious to their attractions.⁸⁴

Scientific knowledge, even if superficial, was prestigious and desirable.

Under the influence of scientists like Liebig, many cooking authorities also began including scientific breakdowns of foods in their books. *Murray's Modern Cookery Book* borrowed from William Beaumont's work on digestion, noting the time that it took various foods to be processed, for instance.⁸⁵ Catharine Beecher, much like Acton, declared that her *Domestic Receipt Book* “contains the principles discovered by Leibig [*sic*], Dûmas, and Brossingault [*sic*], and applies them practically to the subject of food.”⁸⁶ She, however, went further than Acton, summarizing the division between gluten, albumen, caseine, and fibrine, for example; categorizing “nourishing” and “stimulating” items; and stating foods' various digestibilities.⁸⁷ The mistress was responsible for providing her family with a scientifically healthy balance of these foods. “A good housewife,” as another writer explained, “will so arrange the food of the household as to supply a

judicious mixture of bone-forming, strength-giving, or nitrogenous, and warmth-giving, or carbon material.”⁸⁸ Although the process was slow and often uneven, cookery books were becoming more scientifically oriented, so that by the 1880s one could tell readers that “Bones contain from 39 to 49 per cent. of gelatine The proportion of bone to meat should not exceed a sixth part in weight.... The ration of soup is $\frac{1}{4}$ pint for each lady, $\frac{1}{2}$ pint for each gentleman.”⁸⁹ Cookery was almost totally reduced to prescription. Perhaps unsurprisingly, this calculated cookery, all but ignoring art and taste, was often invoked in political economy and discussions of feeding the poor, particularly through nourishing soup. An article in *Household Words* explained how science could “Make use of every material possible for food – remembering that there are chemical affinities and properties by which nutriment may be extracted from almost every organic substance.”⁹⁰

This process of spreading scientific knowledge, however, took time, and its usefulness was often questionable. *The Servant's Magazine* included precise information about the mass lost in beef during cooking: “190 lbs. of beef lose 61 lbs. 2 oz. in roasting, 280 lbs. in boiling lose 73 lbs. 14 oz., 90 lbs. in baking lose 27 lbs.”⁹¹ This information was lifted from an 1810 article in the *Philosophical Magazine*, “An Estimation of the Loss of Weight which Takes Place in Cooking Animal Food,” which had already been reprinted in Kitchiner’s book, as well as several American collections.⁹² Scientific information moved from relatively elite and specialized journals, through middle-class books and periodicals, and finally to the materials that this class recommended for their servants. Whether the cook could use such information, however, is more doubtful, since it was grossly

removed from any context. The middle class seemed to seek scientific facts in their homes on principle, complementing their perhaps more practical interests in water, ventilation, and other “domestic sciences.”

The chemistry and physics of the cooking process itself were also a point of consideration. For household guide writer Charles Pierce, roasting was a matter of (incorrect) physics: “the meat is made to revolve, in order to throw, by centrifugal force, the juices rapidly to the centre.”⁹³ Scientific analysis was especially crucial when new technology was involved; Pierce noted that closed ranges could affect the taste of meat, since “a certain portion of the oxygen of the air is, it would appear, essential to the development of the flavour.”⁹⁴ Often, however, such guides did little more than make explicit or prescriptive what had formerly been left to the cook’s discretion. The 1845 edition of *The Cook’s Oracle*, for instance, recommended that a dripping-pan be no less than 20 by 28 inches, information that earlier editions had simply left to the cook’s judgment.⁹⁵ Other facts were purely supplementary. The *Englishwoman’s Domestic Magazine* used science to explain why pots and pans could not have metal handles directly attached, for instance, and some writers referenced oven temperatures, even though high heat thermometers were not yet available for the home.⁹⁶ Mrs Loudon declared that 250 to 300 degrees was sufficient for bread, although she went on to restate the old sensory tests, still far from redundant.⁹⁷ Cooks who were serious about confectionary might also buy, as *Murray’s Modern Cookery* suggested, a “simple saccharometer, to be had at any instrument-maker’s,” which measured a sugar solution’s density. The book provided a reference table for such a device.⁹⁸

Although the writer complained that books by professional *cuisiniers* were “too scientific for the comprehension of common cooks,” *Murray’s* was devoted to “recent improvements in the culinary art,”⁹⁹ including new apparatuses.

The growing chemical foods industry, moreover, linked science and the kitchen even more closely. Sodium bicarbonate arrived on the market in the 1840s, followed by baking powder and self-rising flour by 1853.¹⁰⁰ While Andrea Broomfield points to the 1850s as the pivotal decade when such chemicals replaced more expensive, time-consuming natural recipes, the 1823 edition of Kitchiner’s book referred to Pyrolingeous acid, a technical name for Crystal Vinegar, and he suggested “Coxwell’s crystallized Lemon Acid” as an alternative to fresh lemon juice; tartaric acid, he noted, was an inferior substitute.¹⁰¹ These terms suggest that readers thirty years earlier were growing comfortable with, or at least interested in, chemistry and artificial substances, although guides before the 1820s seldom referred explicitly to chemicals.¹⁰² In fact, by the 1850s food chemicals were the targets of serious criticism. Mary Ellen Meredith’s words in *Fraser’s* in 1851 were reiterated in Pierce’s book:

We have brought chymistry into our kitchens not as a handmaid, but as a poisoner; she would have taught us the principles of assimilation, affinity, and harmony, and would have instructed us in the laws of preparation, arrangement, and the true theory of the application of the heat; but we desired her to conjure bread with muriatic acid and soda, and separate osmazone from gelatine and albumen. We attempt more, and know less how to set about it.¹⁰³

Food Adulteration

Meredith's words relate to one of the clearest examples of chemistry in the kitchen: the increasing concern with food adulteration. In this regard Melanie Keene observes that "this similarity drawn between cookery and chemistry was not necessarily a comfortable or comforting one."¹⁰⁴ Concerns about adulteration were hardly new. John Farley's late eighteenth-century *London Art of Cookery*, for instance, included a section on detecting the adulteration of flour and bread. For identifying alum, used to make cheap flour look whiter and firmer and promote rising, he suggested a thoroughly scientific process: setting up a glass cucurbit, an apparatus generally reserved for distilling and chemistry, in a sand furnace for twenty-four hours and watching chemical constituents separate. He acknowledged, however, that "cucurbites [*sic*] and sand furnaces are not at hand in private families," and he gave "a more familiar method" involving heating bread and water over a fire. Any impurities would remain at the bottom.¹⁰⁵ Farley's more elaborate advice was probably seldom followed, but it gave him an appealing authority. He was quoted, although without attribution, in Charlotte Mason's *The Lady's Assistant for Regulating and Supplying the Table*.¹⁰⁶

Efforts to popularize and address the problem continued in the nineteenth century. Accum's *Treatise on Adulterations of Food and Culinary Poisons* (1820), for instance, aimed to abolish contaminants through education. The book claimed to offer, in plain language, "easy methods of detecting the fraudulent adulterations of food," accessible to "persons unacquainted with chemical science."¹⁰⁷ In reality, however, many of the processes Accum suggested were

highly scientific, requiring chemical skill, materials, and judgment.¹⁰⁸ Still, despite this inaccessibility and their relative powerlessness, audiences clamoured to know more about sensational adulterations. Accum's treatise, known as "Death in the Pot," went through many reprints, and powerful scientific interests turned their attentions to this lucrative issue as well. From 1851 to 1854, medical doctor Arthur Hassall, leading the Analytical Sanitary Commission of the *Lancet*, did a series of reports distributed widely in newspapers, magazines, and a book.¹⁰⁹ Information about adulteration was everywhere. But such works faced legitimate criticism. A review in *Blackwood's* wondered if Accum, the "official blockhead," expected readers "to resort to the cider cellar, or the Burton ale-house, loaded with retorts and crucibles, and with our pockets crammed with tincture of galls, ammonia, and prussiate of potash."¹¹⁰ The review was popular enough to merit several republishings.¹¹¹ Moreover, although Accum and Hassall drew attention to the problem and forced some early legislation, only in the 1870s did new acts and inspections bring about any significant improvements.¹¹²

As they always had, cookbooks and magazines, which speak more directly to women, continued to inform about food adulteration and water quality, and suggested ways of avoiding or remedying problems, including grinding one's own coffee, buying a water filter, or pouring lime water into the cistern.¹¹³ But fears about adulteration hardly turned women into chemists. The *Englishwoman's Domestic Magazine* focused only on simple tests. Ochre in cocoa could be detected by burning, and one article summarized a letter to the *Times* from a professor of practical chemistry; he provided a very simple way of testing water

for impurities.¹¹⁴ *Enquire Within* only went so far as to recommend a cheap Stanhope lens, available for half a crown, “or one of the glass water bulbs that are sold by men in the London streets at one penny each,” and noted that even “a common phial filled with water possesses a high magnifying power.”¹¹⁵ These makeshift laboratory instruments were unsuited for serious chemistry. Neither Acton nor Beeton, moreover, took a good look at adulteration in their famous works; the issue, perhaps, was tired. Acton reserved discussion of the problem for her *English Bread Book* (1857), but included little information on the detection of contaminants. She and other writers simply recommended that families make their own bread.¹¹⁶ But this was a serious inconvenience when seemingly fine bread was so easily available from a local and well-known baker, part of a network of apparently reliable retailers supplying the middle-class home. Women were quick to adopt some rational approaches to cookery, but they seldom pursued chemistry when it made their lives more difficult. Farley was no doubt correct when he suggested, with regard to verdigris in copper pots, that “rather than quit an old custom, the greater part of mankind are content to swallow some of this poison every day.”¹¹⁷ Indeed, despite the availability of other equipment, warnings against copper continued through the 1800s. To a nation accustomed to sensation, avoiding fear and fad were well-practised skills, and chemistry straddled a narrow line between resource and liability.

Conclusions

Scientific knowledge, to varying degrees, found its way into women’s homes and lives in the nineteenth century. When John Murray decided to update

Rundell's turn-of-the-century book in the 1850s, he included new chapters on nutrition, digestion, and various culinary utensils and apparatuses. The new author also examined the fundamentals of food, noting, for instance, that "The basis of all well-made soups is composed of ... stock."¹¹⁸ This was not news to cooks, but Murray's book stated it explicitly, almost as a scientific principle. Fact, analysis, categorization, and quantification were key to a new epistemology of cookery, a new "social discipline."¹¹⁹ Of course, a gap remained between ideal and practice. Women certainly did not obey all exhortations to accuracy. One mid-century book, for instance, advised readers to keep kitchen scales out on a shelf or table to discourage estimation. And there were also ongoing problems of consistency. A cookbook from the 1880s pointed out that spoons differed in size, so weighing was preferable for refined sauces, and measuring systems even co-existed within books.¹²⁰ Similarly, a "gill," which Beeton uses at least four times, generally meant a quarter pint, but in some regions it might mean a half pint.¹²¹ The ideals of science and accuracy existed within a context of persistent customary usages.

But the fact that cookbooks gave such measurements in the first place indicates a shift toward a more scientific household. Readers and reviewers responded to cookbook writers' confident attempts to apply medicine, chemistry, and scientific rigour to their work. In fact, this new orientation of science to the home, and the home's new orientation toward science, were seen by many commentators as a sign of personal and national advancement. The parallel between the progress of cookery and the progress of mankind was a common trope throughout the nineteenth century. *Blackwood's Edinburgh Magazine*

observed in 1817, for instance, that “[t]he progress of cookery is, in fact, the progress of civilization; and it is impossible to trace the improvement of the one, without having our attention perpetually called to the gradations of the other.”¹²² Beeton traced a tidy evolution of cookery, too, from the Primitive Ages through to the Age of Roasting.¹²³ The application of science was the latest development. “Of late years,” wrote *Murray’s Modern Cookery Book*, “. . . [cookery] has gradually risen to a branch of science, founded on practical experience, combined with a knowledge of chemistry; and the numerous works published on its improvement, both in this country and on the Continent, have brought it to a degree of perfection which its early professors never expected to attain.”¹²⁴

Although scientific cookery gave women access to this prestige, the example of Acton’s updated *Modern Cookery* illustrates how women continued, at least superficially, to defer to the male authorities who were responsible for most of the advances in the scientific understanding of food. Women could, however, take on significant responsibility as the apparent interpreters of scientific works. The long title of Acton’s book implied that she read the eminent chemists and translated their principles into her recipes herself. Whether this was true or not, she combined masculine authority with feminine accessibility, and allowed women to define their family’s social status through their approach to their domestic responsibilities. As Count Rumford, a late eighteenth-century scientific celebrity, explained, men of science had always been respected, and chemistry was, in some enthusiasts’ estimation at least, essential for middle and upper-class gentility, distinguishing, as Golinski puts it, “civilized man from the

untutored savage.”¹²⁵ The scientific and progressive ethos was heavily classed, and by sharing in it, a woman could ensure her family’s position. As Acton declared,

[I]t is of the utmost consequence that the food which is served at the more simply supplied tables of the middle classes should all be well and skillfully prepared, particularly as it is from these classes that the men principally emanate whose indefatigable industry, high intelligence, and active genius, we are mainly indebted for our advancement in science, in art, in literature, and in general civilisation.¹²⁶

Intelligent cookery literally fed men of intelligence. The knowledge, diligence, and rationality that guaranteed men’s and the nation’s progress in business and industry had to be grounded in and mirrored by the home. Middle-class women had to embody and encourage the same values as their middle-class husbands. Scientific knowledge made its way into the home, and women, to a large extent, internalized and accepted it as desirable. And they could do so without deviating from the role of domestic counterpart to the working husband. The *Medico-Chirurgical Review* thus directed Acton’s cookbook to doctors’ families. It would, the reviewer said, “prove as useful to young Mrs. and her cook in the kitchen, as Thomson’s Dispensary or Conspectus to the young doctor in the library.”¹²⁷ The middle-class woman was not the idle counterpart to her active husband, but a partner in the ongoing struggle for status, a status defined, at least in part, by a shared set of systematic principles. As Philp insisted, a modern woman was not fully actualized without a scientific understanding of her environment.

Chapter 2: Material Changes in the Home

“[S]cience and art should once be brought cordially to embrace each other, and to direct their united efforts to the improvement of agriculture, manufactures, and commerce, and to the increase of domestic comfort.” – Count Rumford¹

Introduction

In the nineteenth century, wrote R.K. Philp, science was taking an increasingly “domestic turn.”² This chapter looks at how science and technology physically influenced the domestic space, in particular the kitchen. In doing so, it challenges scholars such as Theresa McBride and Siegfried Giedion, who have argued that technology made few inroads into the Victorian home, largely because of the availability of cheap servant labour.³ In fact, although the scientists, artisans, and engineers who drove industrialisation were often at odds, they agreed on the possibilities for scientific investigation and application in nearly every aspect of life; conversely, a mythology sprang up surrounding daily life’s ability to teach and inspire great science and industrial technology. A boiling kettle, for instance, was said to have triggered James Watt’s ideas about steam power, while Humphry Davy made his first safety lamp experiments in an ale-glass.⁴ The science of domestic life was a popular topic, and the Royal family’s interest in gardening, farming, and model homes prompted Mrs Caddy to ask in 1877, “Why then, should we alone think it improper, unlady-like, and what not, to study these everyday utilities, and plan improvements in sinks and boilers?”⁵ The home was a sophisticated place to be studied and improved through technology.

Tracing the history of technology in the home also reveals the societal embeddedness of technological systems. As Thomas P. Hughes explains,

technological systems “are both socially constructed and society shaping.”⁶ They extend well beyond artefacts or organizations themselves to include legislation and natural resources, for example,⁷ as well as, this chapter argues, ideology. Like the science of cookery, however, technology also takes on new meanings in the domestic space. By examining the kitchen equipment, gas lighting, plumbing, and communication technology in the Victorian home, this chapter shows that middle-class families had their own distinct versions of science and technology, linked, but, as with cookery, not enslaved, to an elite culture of experts.

Technology and the Home

Advertisements and exhibitions indicate that modern industrial technologies had a strong material influence on the nineteenth-century home, and in particular the kitchen, where they took forms both large and small.⁸ Prior to this period, most of the cooking for the middling sorts was done over an open hearth, with only basic tools; even saucepans were a relatively recent arrival. By the end of the 1850s, however, a well-equipped kitchen might contain a digester for pressure-cooking soups, pulpers for steamed roots and vegetables, suet and parsley choppers, and slicers for cucumber and potatoes.⁹ Butter and milk were imported daily to London by rail. Some gadgets were simply extravagant, such as an automatic basting appliance or toasting jack, or the expensive but “ingenious little appliance” for detecting adulterated milk.¹⁰ Kent’s Knife Cleaning Machine, advertised in the back of the Great Exhibition Catalogue, was available from a prestigious shop on the Strand and came in seven sizes with prices ranging from £4.15s. to £14.14s., about what one might pay a scullion in a year.¹¹ The price of

technology was high, but the appeal was higher. Machines held cultural capital in a rapidly industrialising nation, as indicated by Spong and Co.'s self-designation as "Manufacturers of Domestic Machinery," for example;¹² knife cleaners, and Spong's coffee grinders and mincers, barely qualify as machines. "Patent," too, was a familiar term, meant to attract customers to novelty and originality.

Alexis Soyer, a French-born celebrity chef at the Reform Club, was behind many similar technologies. A great self-promoter, he used his household guides to advertise a line of kitchen products to middle-class readers. Soyer's patent utensils allowed women and private families to share in his public success, and he claimed that these tools offered clear benefits in convenience: "Soyer's Baking Stewing Pan gives hardly any trouble; retains all the nutriment; cooks in one third less time than by the ordinary mode: and there is no part of any animal, however tough, that may not be cooked tender by it," declared one advertisement.¹³ His *Gastronomic Regenerator* (1846) similarly invited women to share in the authority of his position. Soyer claimed to have "minutely studied the disposing and arranging of the building of all sized kitchens," and he included labelled diagrams of the layout and apparatuses in kitchens ranging from the Reform Club and the "Kitchen of the Wealthy" to the humble cottage.¹⁴ By putting domestic alongside commercial organization, Soyer invited women to assume the authority of the professional and examine their homes in analytical, entrepreneurial terms.

This direct juxtaposition of the home and large-scale or for-profit institutions was common in contemporary household technology advertisements, too. An advertisement for Evans's Matchless Kitchener in the *Lady's Newspaper*,

for example, offered references to “numerous Families and Hotel-keepers, Public and Private Schools, Hospitals, &c.”¹⁵ Housewives studied advertising that was seemingly directed equally to male hospital managers, for example. The equipment was, with some adjustments, as appropriate for a major institution as for domestic use, and by implication the housewife’s managerial prowess was comparable to that of a professional. Women were evidently thought to respond favourably to comparisons between the home and public establishments.

The Great Exhibition, which celebrated all things managed and manufactured, also displayed dozens of technologically facilitated domestic improvements. A housewife’s meat might have confronted the “[i]nstrument for slaughtering cattle,” or her honey might have been produced “under an improved system of bee management.”¹⁶ The home was the beneficiary of science and technology. Other items exhibited included the “improved roasting apparatus, with self-acting baster and heat reflector,” as well as a “self-acting cooking stove.”¹⁷ “Self-acting” probably meant that the apparatus was fitted with damper-controlled flues that passed around the oven and boiler, supposedly making the range more flexible and economical and allowing it to do several tasks at once with minimal intervention.¹⁸ While modern, the object was relatively neutral; the term “self-acting,” however, was not. The first half of the nineteenth century hosted a fervent debate about the ethics of self-acting machinery in factories, where the term referred to complex systems that could operate themselves once set in motion.¹⁹ Andrew Ure was an unapologetic enthusiast. As he put it in 1835, “The principle of the factory system ... [is] to substitute mechanical science for

hand skill.”²⁰ Fifteen years later, the debates were largely moot, but the association between technological development, factory discipline, and the home was salient. These issues will be further discussed below and in chapter 3.

The Range: An Industrial Appliance

Industrialisation brought significant changes to the home. The range, for instance, which combined a side oven with horizontal bars, became nearly ubiquitous in the nineteenth century. It was an industrial object, made possible by the great expansion in coal mining and iron production in the eighteenth century. Although many cast iron utensils were manufactured in the early modern period, the discovery of a system for making high-quality iron with charred coal (coke), combined with a boom in the application of steam power, standardization, and division of labour, led to a rapid increase in the production of larger items like grates and ranges.²¹ Coal production rose from about 10 to 150 million tons per annum in the century between 1780 and 1880, and iron from 68,000 to 7,750,000 tons.²² These developments, to which the railway might be added, reinforced themselves and made heavy consumption of iron and coal in the home possible. The range was a product of this industrialisation, probably first developed in the 1770s in the north of England. In 1780 ironmonger Thomas Robinson patented the first open range, so called because the top of the fire remained open. Like many that would follow, it was fitted with a winding “cheek” to contract the size of the fire.²³ Ranges were often supported on brickwork and cemented into the existing fireplace with bricks and lime grout.²⁴ The smoke went directly up the fireplace chimney, and the open flame facilitated meat roasting, while pots and

pans could be suspended on hooks and cranes or rested on swivelling trivets. In the early 1780s, boilers appeared beside the fire as well, forming the basic style that would dominate through the 1800s.²⁵

Ranges like Robinson's were anathema to one of the most celebrated scientists of the period: Count Rumford. Born Benjamin Thompson in Massachusetts in 1753, Rumford spent most of his adult life in Europe, where he worked on rational solutions to problems as diverse as military organization, poor relief, and thermodynamics. His curiosity drove him to produce many domestic inventions, including portable lamps and coffee pots. He saw science as crucial to the improvement of the arts (that is, engineering) and, in turn, to "domestic comfort and convenience."²⁶ Rumford was especially disgusted by inefficient fireplaces and ranges, which he took on as his special research interest. "It will certainly be confessed that neither science nor art has done much either for saving labour or for saving expense, either for convenience, comfort, cleanliness, or economy in the invention and management of a *kitchen range*," he grouched.²⁷ Rumford developed an insulated U-shaped range and separate roaster, and he isolated different functions in order to conserve energy. He installed such a range in Baron de Lerchenfeld's Munich kitchen (see fig. 2.1) and promoted his inventions in Britain; like Soyer, Rumford was an entrepreneur. He planned to use the basement of the Royal Institution to display "contrivances as tend to increase the conveniences and comforts and life, to promote domestic economy, to improve taste, or to advance industry," including fireplaces and kitchen utensils for everyone from cottagers to the wealthy, as well as industrial equipment.²⁸

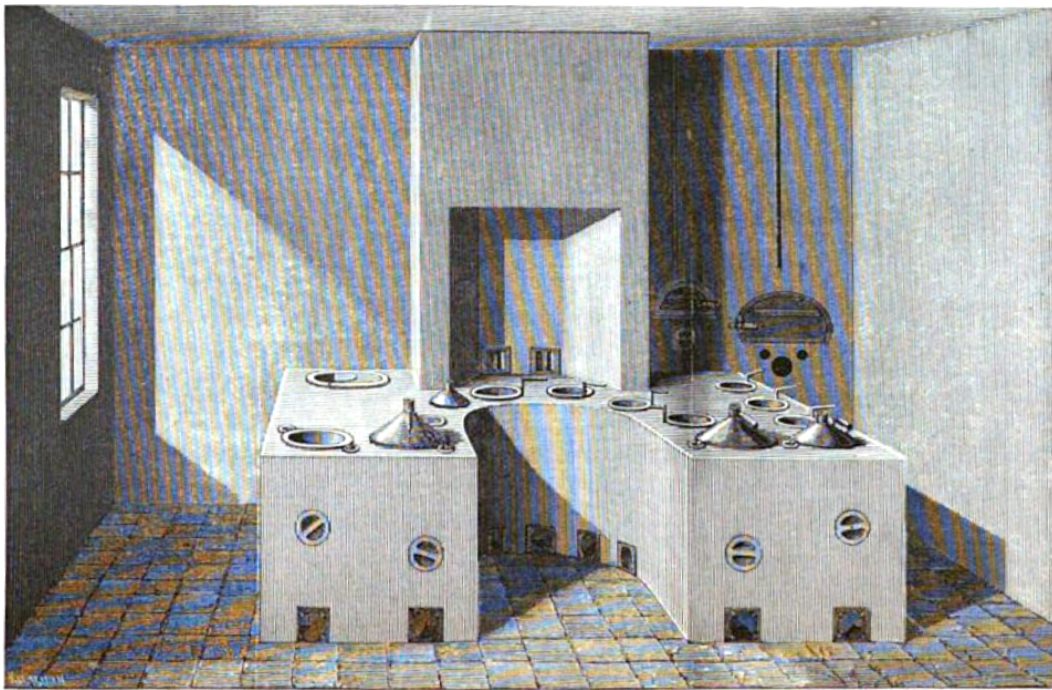


Figure 2.1: “Kitchen Fire-Place in the House of Baron de Lerchenfeld in Munich.” From Count Rumford [Benjamin Thompson], *The Complete Works of Count Rumford*, 5 vols (London: MacMillan and Co, 1876), volume 4, between pages 202 and 203. Google Books.

His house in Brompton acted as an informal showroom, as well.²⁹ Rumford also displayed an organized system of pots and pans, part of what he called the kitchen “machinery,” within which the range and roaster were smaller mechanical parts.³⁰

To Rumford, technology meant the mastery of nature for human comfort. The “planning and executing of machinery,” he wrote, was that “by which the powers of Nature are made subservient to my views, by which the very elements are bound as it were in chains, and made to obey my despotic commands; and not my commands alone, but those of all the human race, to whose necessities and comforts they are made the faithful and obedient ministers.”³¹ This attitude made him the hero of both English and American household management guides.³² Ironically and puzzlingly, however, Rumford’s range was a commercial failure, and his roasters never satisfactory. Alison Ravetz and Asa Briggs point out that while Germans and Americans were accustomed to enclosed flames, the English preferred the open hearth and meat roasted before the fire.³³ Contemporaries confirmed this obstinacy. *A Geographical View of the World*, for instance, noted that the Englishman preferred to sit beside a cold and smoky chimney rather than a German stove, “for his ancestors styled a fire a sort of company; they spoiled their eyes by looking thoughtfully at it, and he must do the same.”³⁴ Although Rumford made a few reluctant concessions to those who insisted on open flames, he, too, was stubborn, preferring to educate: “Cooks in general are averse to all new inventions ... [but] certain alterations proposed will meet with their approbation *when they become better acquainted with them.*”³⁵ While Rumford’s words were quoted by subsequent household management guides, his range was

rarely recommended.³⁶ His philosophies and the systematization of his kitchen suited English ideals, but tradition trumped efficiency, at least in this case.

Rumford's plan was also expensive, while smaller, non-self-acting ranges slowly grew popular in the first decades of the century. In the 1840s, more expensive close ranges, also called kitcheners, became common as well. They had a hot plate over the fire, keeping pans clean and forcing heat through flues. These ranges, however, were difficult to manage. An inexperienced cook would have to keep up a roaring fire to heat the oven, and the apparatus might consume a ton and a half of coal in a month.³⁷ Its open flame, moreover, was often too small to roast efficiently, forcing the addition of special "roasting ovens" or convertible baking and roasting ovens. Purists complained that meat prepared in these tasted "baked," but most women were probably less particular: Jane Carlyle certainly roasted meat "at the oven."³⁸ Kitcheners were also problematic with regard to olfactory comfort. Grease on the hot oven plates, as Mrs Panton explained,

is followed by the odour, which there is nothing like anywhere besides....

These may appear very trivial matters to write about, but a great deal of our comfort and, in consequence, of our happiness depends upon these trifles. I know nothing more disagreeable and trying than a bad smell, and if Edwin comes home to a house reeking of dinner and the oven, what wonder that he flies to his pipe and wishes himself back in his club; while his wife cannot possibly smile and look pleased to see him, when she is suffering untold miseries from the refractory grate, and a cook who would be only too glad to save her the odours if only she knew how.³⁹

Technology was not universally positive, and its management was crucial to domestic morality, happiness, and health. A problem that may never have occurred to a range manufacturer was of utmost importance in domestic practice.

Indeed, ironmongers and engineers filed most range patents, and their focus was usually flue construction and smoke minimization.⁴⁰ Ranges were thus often framed in masculine terms of innovation and progressive development, even as their daily operation was the province of women in the home, an ideally feminized and even pre-industrial space. And when these apparatuses needed repair, which was often, men were the technical experts, invading the home and upsetting domestic isolation (see fig. 2.2). Technology, in some regards, was a foreign body in the domestic sphere. But as the central setting for labour within the home, the kitchen was an ambiguous space, and servants partially mitigated the dirt and inefficiency of the industrial apparatus. Straddling the imaginary lines between interior and exterior, home and work, they did much of the hard labour. Mistresses, however, were not to leave the home unmonitored, which meant, ideally, mastering basic scientific knowledge and analysis. One guide insisted that “Every woman should be taught the scientific principles in regard to heat, and then their application to practical purposes,” in order to properly heat her house, operate her range, and train her servants and children.⁴¹ An 1874 cookbook agreed that the cook needed to be taught the “elementary principles of heat and the construction of ranges, [so that] she would be able to manage her range more economically ... as only an educated scientific cook can.”⁴² The most efficient operation of household technology required technical training, and the mistress



SOMETHING THE MATTER WITH THE KITCHEN BOILER.

(Affectionately Dedicated to PATERFAMILIAS, whoever he may be.)

Figure 2.2: “Something the Matter with the Kitchen Boiler.” From *Punch* 654 (21 January 1854): 24. Reproduced by permission of the Trustees of the National Library of Scotland.

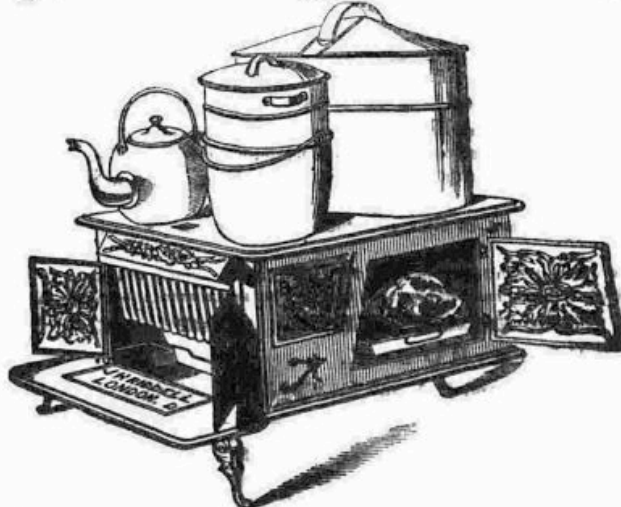
was responsible for seeing that this was done. As the range entered the domestic sanctuary, it challenged the separate spheres; however, the spheres remained intact to the extent that women needed help from men and from household management guides in order to negotiate this challenge.

Servants and manuals helped ease the industrial object's transition into the home, but aesthetics also played a role. For instance, an 1861 advertisement for the Patent American Kitchener in *The Lady's Newspaper* (see fig. 2.3) noted the apparatus's "elegance";⁴³ perhaps its ornamentation was meant to please women who did their own cooking. Caught up in a technological era, moreover, many Victorians saw industrial products in general as attractive or even magnificent. Briggs observes that at the Exhibition "the beauties of cast iron, used for many everyday objects in the kitchen and the cellar, were noted by people who had nothing to say about utility."⁴⁴ *The Times* and Queen Victoria similarly remarked that the "Machinery in Motion" section, seen as a direct source of British prosperity, was "beautiful."⁴⁵

Gas cookery was also supposed to offer a cleaner, simpler cooking option, and it was experimentally demonstrated in the first half of the century. The Aetna Ironworks, near Liverpool, produced the first British gas cooking apparatus in 1824, and Soyer was a strong proponent, installing gas cookers in the Reform Club in 1841.⁴⁶ He also promoted gas for domestic use, particularly as a complement to coal. In *The Modern Housewife*, Soyer predictably endorsed his multipurpose coal stove, the genteel freestanding "Modern Housewife's Kitchen Apparatus," but he also suggested replacing additional hot plates and charcoal

THE

PATENT AMERICAN KITCHENER.



THIS invaluable STOVE is not surpassed for CONVENIENCE, ECONOMY, ELEGANCE, or COMPACTNESS, by the most expensive Cooking Range. It saves at least *half* the Fuel usually consumed—Is a perfect cure for a smoky chimney—Is elegant and compact in design, clean and convenient in use—Portable and complete within itself—Requires no setting in Brickwork, but can be placed and put in operation in a few minutes by any inexperienced person—Is more durable than the generality of Stoves—Has accommodation in the top for four Boilers, Pots, or Kettles at the same time—Has a large Oven, which is always at a regular heat—May be fitted with a detached Boiler, holding 17 gallons, which is heated by the same fire—Is as cheerful in appearance as an ordinary open-Fire Range—Will cook for a large family, at a cost for Fuel of One Shilling per Week—Yields a constant supply of Hot Water

—Forms an excellent Ironing Stove—and is fitted with a full complement of Cooking Utensils, including 2 Iron Kettles, tinned inside, 1 Tea Kettle, 1 Vegetable Steamer, 1 Large Oval Boiler, with copper bottom, 1 Oval Frying-pan, 1 Round Frying-pan, 1 Gridiron, 3 Iron Baking Pans for Oven, Poker, Rake, Handle for lifting off Covers, &c.

The KITCHENERS can be securely packed for transit, and are delivered free to any Railway Station or Wharf in London.

An Illustrated Catalogue of American Office, Bed Room, Dining Room, and Hall Stoves—Patent Portable Farm and Laundry Boilers—Patent Slow-Combustion Stoves, and Boilers for warming Conservatories, Schools, Churches, &c., with Prices, Testimonials, and full particulars, free on application, and the Kitcheners may be inspected in full operation daily at the

AMERICAN STOVE WAREHOUSE.

155 CHEAPSIDE, LONDON. JOSEPH H. RIDDELL, C.E., Sole Agent.

Estimates prepared for erecting Hot Water Apparatus on the most improved principle, and at the lowest possible cost, and orders executed in any part of the Kingdom by skilled London workmen.

Figure 2.3: Patent American Kitchener Advertisement. From *The Lady's Newspaper and Pictorial Times* 771 (5 October 1861): 223. © The British Library Board, M40117 (microfilm) and LON 83 (hardcopy).

stoves with gas cookers.⁴⁷ These apparatuses, however, were often condemned as expensive to install and dangerous because of potential leakage. Gas-cooked food was also said to be soggy, to smell of gas, and to be alternatively burnt or undercooked from poor heat distribution.⁴⁸ Moreover, these cookers still required blacking, limiting the amount of work they saved. In the 1850s, cooking by gas was still a novelty. One domestic guide referred to ongoing “experiments” with the technology, which still smacked of gimmickry and imperfect science unsuited to “the business of an ordinary kitchen.”⁴⁹ New technology and systems for hiring cookers increased gas use in the 1880s, but the versatile coal range continued well into the next century.

Gas Lighting and Plumbing: Linking Interior and Exterior

Before gas ranges, however, was gas lighting, which one scholar argues “began the industrialization of lighting.”⁵⁰ Its origins were undomestic. The first gas lighting system was installed in Watt and Boulton’s Soho Foundry near Birmingham around the turn of the nineteenth century.⁵¹ London was the first metropolis to be largely supplied with gas, which was lighting the city streets, as well as factories, shops, warehouses, and public buildings, within a few decades.⁵² Gasworks and gasholders were soon prominent on the London skyline, and in the 1840s Carl Gustav Carus described what art historian Lynda Nead has called the “industrial landscape” of the Thames:⁵³ “the masses of houses, the stores, the great breweries, and the immense iron gasometers, rising into the air like large towers or colossal blast-furnaces, and all this without any rule or symmetry, ranged along according as each is needed, mostly blackened by smoke, but always

producing such an immense effect *en masse*.”⁵⁴ By that decade middle-class homes were being equipped with gas, bringing industrialisation into the domestic space.⁵⁵ Borrowing from folklorist W.H. Riehl, Wolfgang Schivelbusch observes that this attachment to the gas mains meant the end of household autonomy, or the “total household.”⁵⁶ Households were now intimately connected to a dangerous outside fuel source, and some advisors suggested that the paterfamilias turn off the main gas tap at night for security against leaks and explosions.⁵⁷

Early gas was also dirty with industry, leaving a “horrible blackness” around the gasolier. In a drawing room, this would be considered “disfiguring,” and Schivelbusch argues that gas was largely excluded from reception rooms, since it was too representative of its industrial origins.⁵⁸ Scholars such as Sarah Milan disagree, noting that tasteful gasoliers were designed especially for parlours, although one late nineteenth-century designer saw some of these as belonging to the dark days of “[c]hain-pulleys, and such mighty machinery.”⁵⁹ One magazine article in the 1880s bemoaned “large ugly gaseliers” anywhere outside the halls, kitchen, or bedrooms.⁶⁰ Gas’s movement through the house, then, was slow, but it usually appeared first in the kitchen, where the gasoliers could be extremely functional.⁶¹ As with the range, the raw technology was suitable, with few aesthetic modifications, for what was a domestic place of work. However, in ill-ventilated basement kitchens, the heat and smell were oppressive. Between 1850 and 1866, in fact, the quality of London gas fell significantly, forcing a House of Commons enquiry that resulted in an 1869 Act of Parliament prescribing minimal quality.⁶² Gas was public business, and the welfare of the

middle-class home was intimately connected to it. Badly laid pipes also contaminated the surrounding earth and tainted the water supply, and authorities suggested that the family check their domestic ventilation, as well as their burners, taps, and meters.⁶³ “Illumination by means of inflammable gas affords one of the most striking instances of the adaptation of scientific discovery to the comforts and elegancies of life,” wrote Thomas Webster and Frances Parkes.⁶⁴ But this domestic industrialisation came at a price.

With its strong links to industry, it is fitting that arguments for gas lighting were often made in rational, quantitative terms. English engineer J.O.N. Rutter argued that gas was not only cheap, but measurably effective, heating water for a bath “[i]n ten or twelve minutes, ... say from 46° to 98°, at a cost of about six cents.”⁶⁵ Its convenience and cleanliness also saved servant labour.⁶⁶ The quantification of gas was made explicit in the use of meters, developed around 1817 and installed in homes by the 1850s.⁶⁷ Charles Babbage, who commended machines for increasing efficiency and consistency in industry, also endorsed moderately priced gas meters for every consumer. “[B]y making each purchaser pay only for what he consumes, and by preventing that extravagant waste of gas which we frequently observe,” he wrote, “the manufacturer of gas will be enabled to make an equal profit at a diminished price to the consumer.”⁶⁸ Rutter similarly called the gas meter “at once the most beautiful, and the most perfect, contrivance that the ingenuity of man has devised, for exercising the functions of an impartial agent between buyer and seller.”⁶⁹ The gas meter was the go-between for two capitalist actors, one of which was the home.

But before gas lighting compromised domestic autonomy, houses were connected to public infrastructure in the form of sewers and piped water, available to London's well-off from at least the seventeenth century. This technology, some argued, had moral advantages, reducing servant gossip at pumps and contributing to decency and improvement.⁷⁰ For nineteenth-century technology enthusiast William Matthews, water companies also symbolized British capitalist prowess and civilization. "Mechanical ingenuity" and "chemical science" had

greatly diversified the means of commercial enterprise. Numerous individuals have thus been stimulated to an extraordinary degree of activity in their respective pursuits, and by signal diligence and industry made those pecuniary acquisitions which naturally tend to increase their influence in society, as well as to generate feelings of personal dignity and independence. To these causes may be ascribed many of the great works which have been devised and executed for public purposes ... generally undertaken as objects of private profitable speculation[.]⁷¹

Matthews's aim was to defend the existing water system against a plot to construct a monopolistic water works, but he also voiced the period's faith in technology. Further progress would follow, with steam engines for pumping by 1810, cast-iron mains installed by 1827, and filtration systems in place by 1829.⁷²

Although far from ubiquitous among even the middle class, plumbing was common enough by the 1840s that Jane Carlyle, who did not have water "laid on" until 1852, wrote that "One girl—Irish, not a bad creature but very violent and unreasonable gave me warning in the first week because 'she could not remain in

a house where there were no waterpipes'! she wondered how anybody could expect a servant to stay beside such an inconvenience'!!"⁷³ But water costs were high. Jane complained that the weekly 4d. she paid to the water carrier more than doubled to £1.16s. a year for running water.⁷⁴ Moreover, while water companies were required by the end of the 1840s to meet demand for pure water at constant pressure in any district within their area, this was not enforced until the 1870s.⁷⁵ In the meantime, low pressure often limited water to the kitchen or scullery, and it might be provided only a few days a week or a few hours a day.⁷⁶ Cisterns were a necessity, and many homes also had water filters. Both required maintenance.⁷⁷ New plumbing, unsurprisingly, was not used exclusively. The Carlyles continued to use their pump, dump sewage in the back drain, and frequent the earth closet in the garden.⁷⁸ As with gas, attachment to a public water supply also meant public danger. Cholera in Camberwell in 1849 forced the water company to start collecting its water above the tideway.⁷⁹ Less seriously, heavy rains and high tides in November 1852 meant stopped and overflowing drains for the Carlyles, wetting their kitchen floor.⁸⁰ Household management guides advised families to evaluate rationally a home's placement and plumbing before moving in.⁸¹

The nineteenth-century home's most salient plumbing advance may have been the development of sophisticated hot water distribution systems. One plan involved interchangeable, interworking parts for a kitchen and washhouse (see fig. 2.4), while other systems pumped hot water upstairs to the bath, an arrangement used by mid-century in the better sorts of houses (see fig. 2.5). Geysers, which used gas to heat water in the bathroom, were available from the

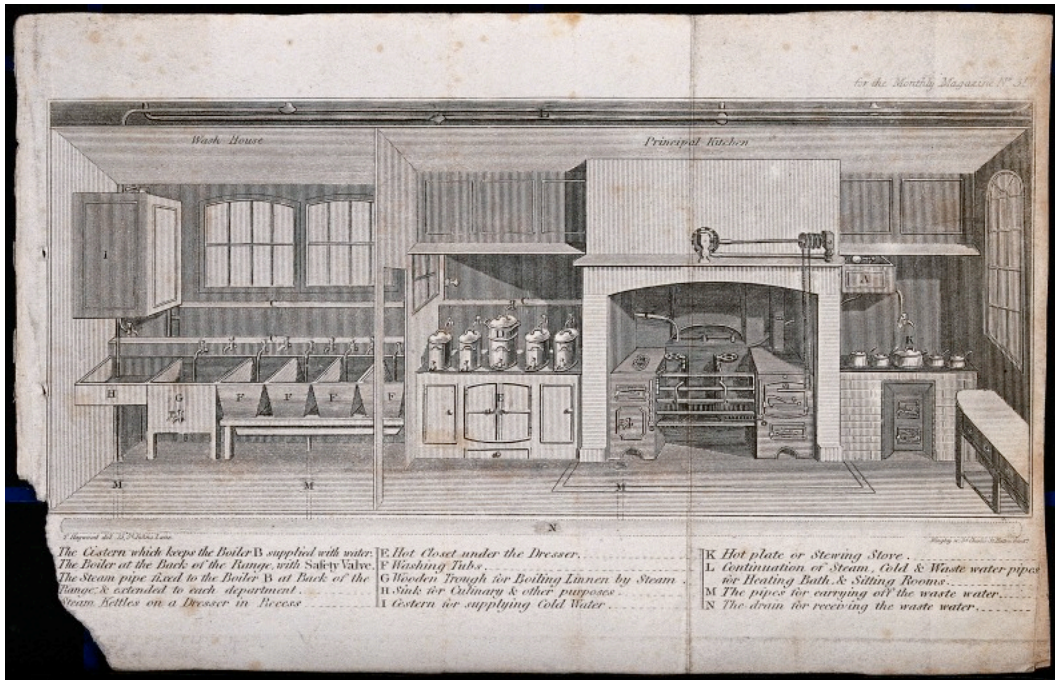
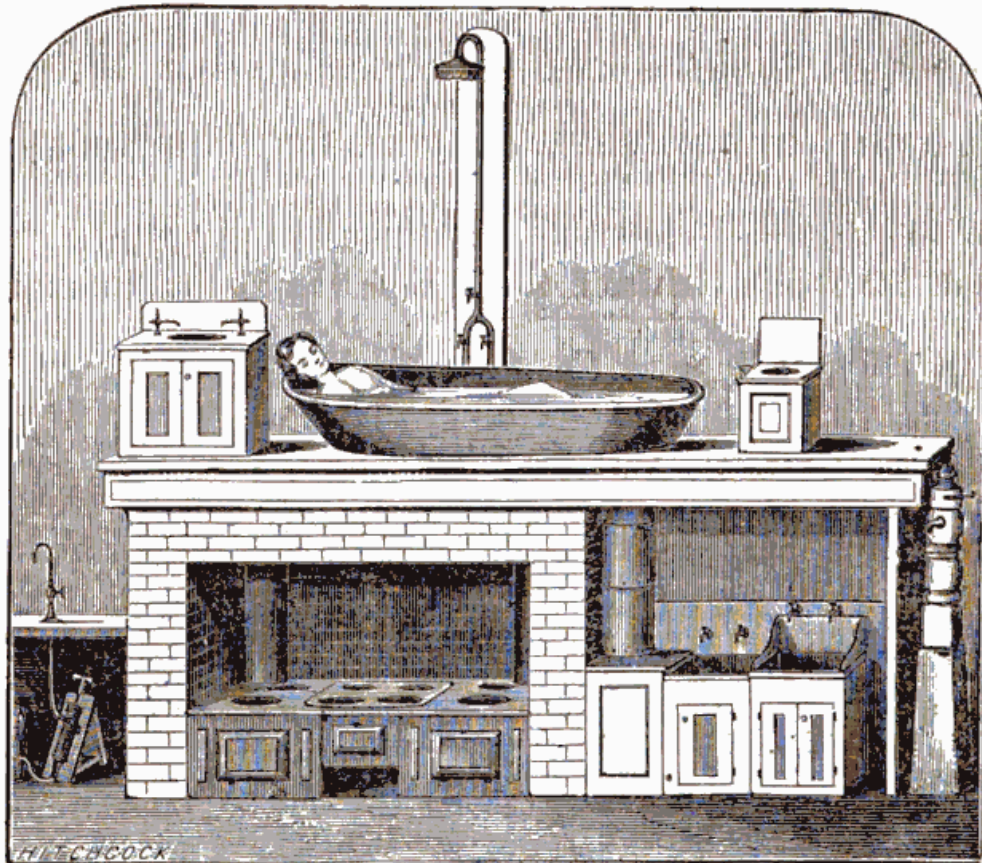


Figure 2.4: Systems of Domestic Technology. Bingley after T. Haywood, “Diagram of a kitchen and wash house, with sinks and cooking ranges,” n.d. Wellcome Library, London.

LOCKWOOD, ZANE & LUMB,



PLUMBERS,

And Manufacturers of Barrows' Patent Cooking Range,

Figure 2.5: Plumbing Systems. From *The Directory of the City of Boston* (Boston: George Adams, 1850), advertisements 16. Google Books. Also reproduced in Siegfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (New York: Oxford University Press, 1948), 695.

late 1860s, as well.⁸² All of these set-ups, however, carried the risk of explosion, a problem that garnered attention in popular papers such as the *Daily Telegraph* as well as in tradesmen's and engineers' publications. Engineer Samuel B. Goslin observed that the problem was resolvable, since "In these days ... every movement in Nature, and every application for the utilisation of Nature's stores and forces, is brought under the rules of science." He recommended regular expert inspection, correct placement of the boiler and pipes, the provision of a safety valve, and proper materials.⁸³ When it came to plumbing, domestic issues were of public concern and were resolved with the rational, scientific help of an expert.

Architecture and Communication Technology

Plumbing was a systematic technology, with interworking parts that accomplished a task. Communication technologies, too, helped the home operate as a system. Long wires passing through walls and attached to bells had existed for centuries in large establishments, allowing the family to call the servants. In the nineteenth century, however, experts sought improvements. At the Great Exhibition, one company showed a system that combined bells and voice-tubes, as well as an index dial bell that indicated which room the ring was coming from.⁸⁴ By the 1870s, battery-powered electromagnetic bells were available.⁸⁵ Babbage, for one, pondered the importation of sophisticated industrial and commercial set-ups. "The simple contrivance of tin tubes for speaking," he wrote, "... produces a considerable economy of time. It is employed in the shops and manufactories in London, and might with advantage be used in domestic establishments, particularly in large houses, in conveying orders from the nursery

to the kitchen, or from the house to the stable.”⁸⁶ Household experts agreed. In 1852, Webster and Parkes echoed Babbage’s words, adding that such tubes would “instantly convey intelligence or orders to the remotest parts of an establishment [and] save an immensity of fatigue.”⁸⁷ Proper domestic management called upon technology justified by rational analysis. Webster and Parkes also suggested, more simply, that basement bells stand in a line, each clearly labelled.⁸⁸ Reducing room for servant error streamlined work and facilitated management.

For those who had the option, the arrangement of the domestic offices, too, could be seen as a communication system that paralleled industrial logic and efficiency. The term “department,” used for household workspaces or tasks, was also heard in manufacturing to refer to divisions of space and labour.⁸⁹ Architect Robert Kerr’s *The Gentleman’s House* (1865) argued that the domestic offices must be contrived “for *work*.”⁹⁰ Each room was designated for one purpose and would fulfill it completely, an exhortation to differentiated spaces that Margaret Posonby argues was in place in the middle-class home by the mid to late eighteenth century.⁹¹ This differentiation not only separated leisure and work, but it also isolated different tasks, although in most middle-class houses this might be limited to the kitchen, scullery, and pantry, for example.⁹² Kerr further insisted that each room must “be placed in its proper relations to those others with whose business its own is more or less connected,” streamlining operations and easing supervision. “[E]very servant, every operation, every utensil, every fixture, should have a right place and no right place but one,” Kerr declared, and he used the term “convenience” for this almost mechanical synchronicity and harmony.⁹³

In his study of modern management, Sidney Pollard observes a similar emphasis on extensive pre-planning in industry. Large-scale breweries and cotton factories, for instance, required foresight in order to operate efficiently or even be possible in the first place. At the outset, the factory site had to be chosen for healthfulness, as well as transport and power. “By the 1820s, in fact, not merely the siting, but also the general design of large cotton mills had ceased to be ‘natural’, and had become planned,” Pollard notes.⁹⁴ James Montgomery’s guide to cotton factory management, indeed, further declared that the machinery had to be “arranged in the manner best calculated to facilitate the progress of the work,” while another early guide to cotton mills argued that “the various departments be so situated, as to prevent all unnecessary going to and from any apartments of the work by the workers employed about the establishment.”⁹⁵ Boulton and Watt, having given conscious thought to, as Pollard puts it, “the organization and purpose of an industrial unit,” believed the same.⁹⁶ By around 1800, Soho’s exceptional qualities included “the fact that a list of all required shops had been drawn up, the machinery to be included, and the operations to be performed in each explicitly stated, and definite specialised uses assigned to each machine.” Moreover, the shops communicated logically with one another, which Erich Roll calls a “remarkable sign of ‘modernity.’”⁹⁷ The division and organization of labour were technologies in themselves, and their principles adopted in the home.

Responses and Conclusions

Domestic technologies, then, were not simply desirable for their own sake, but were part of a larger goal of good management. In *Campaigns of Curiosity*

(1894), for instance, rationally evaluated technology defines the well-managed house. *Campaigns* was a work of stunt journalism, in which American Elizabeth Banks tried various English occupations, including domestic service. Her lack of experience was not a problem, as she intended to apply her analytical skills to elevate housework to “a science.”⁹⁸ In service, she observed that while the inefficient mistress was disinclined to “give any help in the way of labour-saving appliances,” the more enlightened house “had been fitted up with a view of making the work light and easy of accomplishment.”⁹⁹ Through logic and empiricism, Banks saw that gas far surpassed candles in convenience and cleanliness, that a bathroom geyser could save labour, and that light tin trays, rather than heavy iron, facilitated servants’ work.¹⁰⁰ She also advocated hot and cold water pipes upstairs, as well as central heating, which was cleaner, cheaper, and more easily regulated than coal fires. Dumbwaiters, too, were a worthy investment, saving servant labour; they were a technology borrowed from a more commercial setting, first used in the eighteenth century at a Paris café, and recommended for private houses by the 1850s.¹⁰¹ Of course, many of these suggestions were probably ignored. Most English homes, for example, did not have central heating until well into the twentieth century, and a dumbwaiter might require a serious remodel. But Banks’s reasoned, critical approach to the home, employing “education and scientific thought,”¹⁰² reveals the era’s ideals.

Banks’s suggestions in fact descend from advice a generation earlier. In 1871, one *Englishwoman’s Domestic Magazine* contributor recommended saving money with gas instead of lamps and candles, and the servants’ washing might be

done at home with a machine.¹⁰³ Another model housekeeper loved her mincer for preparing leftovers.¹⁰⁴ In 1877, Mrs Caddy recommended carefully analysing and applying those technological “investments” in the home that would “yield large interest” in the form of reduced servant wages.¹⁰⁵ Gas fires were the “key-note of [her] system of domestic economy,” and she also advocated upstairs plumbing and a dumbwaiter.¹⁰⁶ Caddy claimed not to believe in technology for its own sake, but she made suggestions that were fully invested in the advances of her age: “We are daily bringing mechanism to greater perfection, and it is our own fault that we do not make it perform for our houses what Manchester has made it do for our looms, and render ourselves mistresses in reality, instead of merely in name, of our own households,” she wrote.¹⁰⁷ Manchester epitomized industrial, mechanical triumph, where mastership meant control over technology.¹⁰⁸ The home could share in this triumph, and women could achieve this mastership, too.

Many women agreed that technology had the potential to alleviate their domestic burdens. Eliza Lynn Linton, a generally conservative commentator, predicted in 1874 that “Machinery, by which human hands will be spared the dirty and revolting work they have to do now, will be more and more in use in our homes.” The consequences would include more refined servants, with higher wages and better education elevating them almost to the status of gentlewomen.¹⁰⁹ Technology might even effect grand social change. Some imagined communal, mechanically operated laundries, while sanitarian Benjamin Richardson’s vision of the city of health was driven by technology, including piped hot water, excellent lighting, and convenient lifts.¹¹⁰ An 1877 article in the *Englishwoman’s*

Review, moreover, argued that with technological advancements in the home, utilities supplied by companies, and other work outsourced to butchers, bakers, and laundresses, women needed new occupations. “The outer world has pressed so closely into the management of our homes that if domestic economy is to become the satisfactory science which it used to be, our ‘bread-dividers’ must go out from their homes, and extend the benefits of domestic economy to the outer world.”¹¹¹ Women’s responsibility for domestic economy would be manifested in social and sanitary organization.¹¹² Assisted by “mechanical, physiological and chemical” education, women might monitor the quality of externally provided gas and water, for example.¹¹³ The home was no refuge from the outside world; but domestic concerns were still women’s (possibly sole) domain.

Of course, troublesome technology still occupied women at home. Any advantage was accompanied by a host of disadvantages, such as gas lighting’s ventilation problems and “dangers to the eyes.”¹¹⁴ Commentators complained about unruly ranges, and Caddy disliked hard-to-clean mincing machines.¹¹⁵ Bottle jacks were always out of repair, so Beeton proposed a “stout nail and a skein of worsted” instead.¹¹⁶ Another writer refused to recommend any “wonderful, newly-invented frying-pans and infallible gridirons.” She had “collected half a garretful of those and other culinary inventions, and on trial found nearly the whole useless, or little improvement on the old-fashioned utensils.”¹¹⁷ Perhaps she was observing a version of what Hermann Muthesius called the “unthinking modishness” of industry at the Great Exhibition.¹¹⁸ A rational, evaluative attitude was sensible given the number of patents being filed.

But these criticisms operated at the level of the specific, rather than the general. For one writer of household science books, technology's "mischiefs" were little more than "'residues of evil' ... against the predominating good." "[I]ntelligent ingenuity" and education would ultimately "gain control of natural forces for the securing of comforts and luxuries, and ... liberate man from the privations and drudgeries of the uncivilized condition."¹¹⁹ But more general criticisms also existed. For one, technology never met expectations, because it slyly changed them. In the case of gas lighting, for instance, standards for evening visibility quickly increased, inflating gas bills.¹²⁰ Ruth Schwarz Cowan has famously argued that domestic technology in America meant "more work for mother," particularly as expectations rose and tasks piled more heavily on the woman. Some Englishwomen would agree.¹²¹ An 1867 article opined, with regard to the sewing machine, that "If with one part of his brain he [Man] invents a labour-saving appliance, the other lobes immediately create as much new labour as the apparatus saves."¹²² The masculine form is also a reminder that men were responsible for most domestic inventions. Women, moreover, may have held little real consumer power in their selection. Despite the depiction of couples shopping in the Steel and Garland range and fireplace showroom, ninety percent of English homes were rented, and fixtures were often supplied by the landlord.¹²³ Certainly, advertising suggests some female influence, and deals could be struck: in 1852, Thomas Carlyle purchased a range, with the agreement that the landlord would refund him £7.3s. should he move out.¹²⁴ However, the number of complaints about poorly designed technologies suggests limited female power.

Satire, moreover, signalled a disapproval with the pace and extent of change, which bordered almost on obsession. In the American *Sparrowgrass Papers* (1856), for instance, the foolishly modish husband fixates on a mechanical bedstead. To “place your self in the hands of the invention” is to guarantee early rising, as the apparatus throws the slugabed to the floor.¹²⁵ He is thrilled:

[T]his machine is one of the most remarkable evidences of progress, the ingenuity of man has yet developed. In this bedstead we see a host of cardinal virtues made practical by science. To rise early, one must possess courage, prudence, self-denial, temperance, and fortitude. The cultivation of these virtues, necessarily attended with a great deal of trouble, may now be dispensed with, as this engine can entirely set aside, and render useless, a vast amount of moral discipline. I have no doubt, in a short time we shall see the finest attributes of the human mind superseded by machinery.¹²⁶

After being launched from the bed half a dozen times in one night, however, Sparrowgrass decides that “we are not mere bits of mechanism after all.”¹²⁷

Technology might appear to be a convenient shortcut to the establishment of proper middle-class values, so well enumerated by Sparrowgrass, but, in fact, technology was better used to *serve* the middle class, not master them.

Less hapless than Sparrowgrass, and more enamoured with order, was *Hard Times*'s Gradgrind, an “arithmetical figure.”¹²⁸ His Stone Lodge indicates the connection between reason and technology, with “[g]as and ventilation, drainage and water-service . . . , [i]ron clamps and girders, fireproof from top to bottom; [and] mechanical lifts for the housemaids.”¹²⁹ “A man of facts and

calculations,” Gradgrind exaggerates middle-class aspirations.¹³⁰ Success depended on rational and systematic factories and commerce, but when these became the sole aim and absorption, they alienated equally desirable emotion and love. Charles Dickens dedicated *Hard Times* to Thomas Carlyle, with whom he sympathized over the mechanical oppressiveness of society.¹³¹

Gradgrind is an extreme, but smooth, technologically supported domestic operation was commonly endorsed. Guides spoke not only of machinery *in* the home, but the machinery *of* the home. “[E]ven the smoothest-running domestic machinery becomes clogged and out of gear,” wrote one, while Beeton declared that tidiness was necessary so that “the whole apparatus of cooking may move with the regularity and precision of a well-adjusted machine.”¹³² Moira Donald argues that the aristocratic household, with its invisible servants and well-ordered regularity, was the model for the middle-class ideal of smoothly functioning cogs and wheels, but she neglects the importance of the metaphor itself.¹³³ As George Lakoff and Mark Johnson note, metaphors are culturally specific, grounded in co-occurrence or similarity.¹³⁴ The machine was an ideal, familiar enough that it could help the middle class envision and understand their increasingly structured and mechanized daily lives. Fittingly, the best examples of the metaphor are from the 1860s and later, when domestic technologies were more fully established. The “home as machine” metaphor shifts from metonymy to synecdoche. Women are to master and command technology, to become the parallels of their husbands; inability to do so, whether at work or in the home, was a sign that one did not belong in bourgeois society. As Elizabeth Langland explains, this ideal

“amalgamates the cultural capital produced in the home with the material capital produced in the marketplace.”¹³⁵ However, this command should not go so far as to dehumanize, for the home is still a moral centre. Women resolved this paradox through compromise: no home would run as smoothly as a machine, but female attention, guidance, and good humour would oil or even conceal the gears.¹³⁶

Despite these criticisms and complexities, there was a real belief that technology could improve life. For Rumford, “all the successive improvements in the condition of man, from a state of ignorance and barbarism to that of the highest cultivation and refinement, are brought about by the use of *machinery* in procuring the necessaries, comforts, and elegancies of life.” Moreover, the “pre-eminence of any people” could be “estimated by the state of *taste, industry, and mechanical improvement* among them.”¹³⁷ Although Rumford seldom mentioned women, they were participants in a process of seemingly inevitable advance.¹³⁸ Thomas Carlyle complained about the mechanization of society, and in 1844 his wife marvelled at the servant who had the audacity to complain about their lack of plumbing. But by 1855 they had both water and gas laid on. And the process was not simply top-down. Women were instructed to look critically at technologies, and the spheres adapted to one another. In the home, technology took on new meanings. It could be a path to social liberty, an inconvenience, a danger, a challenge, or a symbol of middle-class status, conferring honour and professionalism upon women. It certainly did not diffuse to a passive audience.

Chapter 3: Household Management¹

*“Estimating everything at its real value,
Keeping everything to its proper use,
Putting everything into its proper place,
Doing everything at its proper time, – and
Keeping everybody to his proper business, –*

would perhaps comprehend all, or nearly all, that can promote comfort, order, and contentment, in our hearts and homes.” – M.B.H.²

Introduction

Maxine Berg argues, with regard to the industrial environment, that the introduction of the machine cannot “be considered outside the questions of effective management.” The “scientific technique and the machine,” she continues, were introduced not just for their effect on productivity, but because they embodied order, precision, and measurement, “features of control.”³ This chapter looks more closely at the management of people, things, time, and money in the home. L.S. Jacyna has identified “managerialism” as a key Victorian social value, alongside nationalism and racism, and this chapter concurs.⁴ Management techniques that were encouraged in the industrial and commercial communities, such as the maximization of labour productivity, the rational organization of time and goods, and cost accounting, were also endorsed in the domestic space; in some cases, the two spheres even overlapped. The middle-class woman was defined not only by her mastery of certain sciences and technologies, as discussed in the first two chapters, but also by her authoritative approach to the home.

Managing People

Economist Gregory Clark describes two stages in the industrial revolution. The first is the bringing together of workers into workshops or manufactories; the

second is the imposition of factory discipline, in which “the employer dictated when workers worked, their conduct on the job, and that they steadily attend to their assigned tasks.” Workers were rewarded according to their behaviour.⁵ The Soho Engine Manufactory exemplifies this shift. In its early stages, division of labour was inconsistent and smiths and engineers might do a variety of jobs.⁶ The firm, however, depended heavily on machinery, and by around 1800 it was extremely organized, with well-trained workers, precise processes, and division of labour.⁷ Most intriguingly, argues Clark, coordination was not the primary reason for factory discipline, but rather coercion, forcing workers to do “more than they would have freely chosen.”⁸ In the Marxist narrative, workers became detached and demarcated from their employers and place of employment, and lost the sense of cooperative community.⁹ Shareholders’ banquets replaced workers’ feasts, and Andrew Ure praised Richard Arkwright for understanding the importance of “training human beings to renounce their desultory habits of work, and to identify themselves with the unvarying regularity of the complex automaton.”¹⁰ Even in cases where the supervisors were known to be philanthropic, as with Robert Owen, the machine metaphor was paramount. Owen declared that he had “expended much time and capital upon improvements of the living machinery,” and was delighted that these expenditures were “now producing a return exceeding 50 per cent, and will shortly create profits equal to cent per cent on the original capital expended in them.”¹¹ Visitors to the mill commented on the happiness and virtue of the workers, but also their organization, with scheduled hours and breaks.¹²

Historians such as Bridget Hill have examined a parallel replacement of the paternalistic system of domestic service with a more professional structure in the eighteenth century, a trend that continued to evolve in the nineteenth.¹³ But this professionalism was not necessarily empowering. As the ideal distance between masters and servants generally grew, discipline became the stated goal in many household guides, necessary, they argued, in part because of the worker's unthinking nature. In 1852, *Home Truths for Home Peace* assumed it was the mistress's responsibility "to think, to order, to provide, to arrange, to look, to overlook, to remember, to remind, – and she has no more *right* to *expect* these things from her servants, than they have to demand from their mistress that she should get up *first*, to light the fires, or take their places in the kitchen."¹⁴ Even into the 1880s, guides stressed that servants could not be relied upon to work rationally, even if it meant more leisure time: "If [servants] cannot think of this for themselves, we can for them, and by properly arranging their work by degrees, get them into methodical ways," wrote one.¹⁵ The servant's place within the well managed home was essentially the same as machinery, and one guide even allotted each servant three-quarters of a pound of soap a fortnight "for personal use and cleaning purposes."¹⁶ No distinction is drawn between the work of the house and the needs of the individual.

As with factory hands, this model coexisted with religious and secular efforts to elevate and edify servants.¹⁷ But the mechanistic parallel between domestic and factory work has been less well studied, even as the "home as machine" metaphor, discussed in the last chapter, encompassed a growing

dehumanization of the servant body.¹⁸ At the level of personnel management both settings idealized the automaton, and references to servants as machines became explicit. Some writers were more sympathetic than others. *The Ladder of Gold* (1850) declared that “the luxury and high living maintained with such faultless taste on the surface, could not be kept up without the help of that servile machinery which performs its useful operations in the kitchen, the butler’s pantry, the scullery, and the wine-cellar,”¹⁹ while *The Servant’s Practical Guide* (1880) kept only the thinnest of lines between machinery and humans, stating that “without the constant co-operation of well-trained servants, domestic machinery is completely thrown out of gear.”²⁰ Their quick hiring and firing also suggests machine-like interchangeability. By reducing the servants to the essence of the domestic machinery, the mistress assumed the appropriate middle-class managerial role, even though in a modest family she might do much of the work herself.²¹ These women, too, risked dehumanization. Mary Booth complained that she was a “domestic machine,”²² and Eliza Warren reminded readers to continue their music and dancing: “Why should a girl be educated at all if she is soon after marriage to dwindle into a mere household machine[?]”²³ Managerial distance was crucial. Mastership in both home and factory required knowing how the work ought to be done, but the manager could not descend, as the workers could, to the level of machinery.²⁴ As Elizabeth Langland has observed, middle-class women may have been subservient to men in a “gendered politics of power,” but “in a class politics of power, they cooperated and participated with men in achieving middle-class control through the management of the lower classes.”²⁵

But the human cost of figurative mechanization troubled many. Sarah Stickney Ellis, the great moraliser, reminded “thoughtless young ladies” that their “household machinery” was “composed of individuals possessing hearts.”²⁶ Ellis was not averse to the “home as machine” metaphor,²⁷ but she worried about the mistress’s conscience, as well as servants’ physical and emotional health. Eliza Lynn Linton’s approach to the concept of domestic machinery was more complex. Linton had a reputation as a conservative writer, but in 1874, she took the side of maids in *Cornhill*, frustrated by employers who “lament that servants are taught even to read and write. They maintain that the more ignorant the woman the more likely the machine. And a docile machine, a transferable slave – that is their ideal of a good servant.”²⁸ Domestic service was now a matter of business, with labour sold for the highest price, but Linton argued that employers, while free from the obligations of paternalistic proprietorship, still wished to retain “the submissive service of slaves.”²⁹ A new order of relations was needed. Linton’s first proposal was to treat maids as respected helpers. Failing that, or perhaps in addition to it, she saw that routinization and business values could actually empower workers by defining their obligations.³⁰ She admired hotels where the servants

have their work clearly defined and exactly apportioned. It is an orderly, almost scientific arrangement of time and duties; and if a servant chooses, she need never hear a harsh word nor receive an order.... For even housework is following the scientific tendencies of the age, and the constant phrase of a servant, “I know my business,” expresses the more professional and less domestic aspect characteristic of modern service.³¹

Impersonality and consistency, rather than nagging and abuse, would define mistress-servant relations. Elizabeth Banks similarly endorsed the liberating replacement of paternalism with business, preferring the term “employer” to “master” or “mistress,” which “savour[ed] of slavery days.”³² She also wanted to do away with beer money, customary to domestic service: “A business man in the city is not expected to furnish a daily allowance of beer to each one of his clerks; and, if domestic service is to be raised to a proper standard, this matter of beer-allowance must be dispensed with.”³³ Having worked independently, both Linton and Banks knew the importance of professional relationships.

Managing Time

Theresa McBride estimates that “as much as a third of the text of typical domestic economy manuals dealt with the use of time.”³⁴ If the servants were to work with the rigour of machines, they needed a schedule; timetabling is one of the clearest examples of the industrial-managerial ethic in the home. In the spirit of this precise domestic quantification, William Kitchiner recommended a large kitchen clock that kept time exactly with the clock in the hall or dining room. Servants were to “be punctual [and] take care that as soon as the *clock strikes*, the *dinner-bell rings*: this shows the establishment to be orderly.”³⁵ The mistress should establish daily routines, encompassing, as another guide put it, “the daily work of each servant, and the hours for doing it, as well as the days on which extra cleaning is to be done. The hours for rising, meals, retiring, and all matters on which order and comfort depend, should also be written down.”³⁶ The mistress might post these instructions in the kitchen (with a duplicate for reference in the

back of her account book), along with the rules of the house and “the REWARDS given to those who attend them, for long and faithful service,”³⁷ almost like a discipline-enforcing contract. Such clear orders, entailing early rising and steady work, were crucial to the “economy of time,” and supposedly saved wages by preventing hurry and fatigue.³⁸ Monitoring the home numerically seemingly guaranteed good management. And good management of people, as of machinery, meant consistent work without excessive friction or wear. One guide compared the human body to the steam engine: “calculated to do a certain amount of work in a day, [it] will wear out very rapidly if forced to do double that work.”³⁹

Time management not only emulated mechanical regularity, it required it. As Charles Babbage put it, “Clocks occupy a very high place amongst instruments by means of which human time is economized.”⁴⁰ By the nineteenth century, an influx of American mass-manufactured brass models, as well as French, Dutch, and German products, meant that an economical clock with an alarm might cost as little as 12s.⁴¹ Clocks were prominent in representations of kitchens, whether chaotic or well ordered, perhaps as a reminder of what should be (see fig. 3.1). The spheres of home and work were hardly differentiated by task versus time orientation.⁴² But clocks had in fact been in homes for centuries. By the first quarter of the eighteenth century, culinary texts assumed familiarity with a timepiece, while Lorna Weatherill notes that the number of London household inventories with clocks rose from eleven per cent in 1675 to fifty-one per cent in 1725.⁴³ The trajectory is clear. Another study concurs that clock ownership grew dramatically in Kent from the mid-seventeenth century through the eighteenth,



Figure 3.1: The Family Plum Pudding. “A woman hauls a large steaming bag out of a huge vat in a kitchen,” n.d. Wellcome Library, London.

and clocks were “more likely to appear in the ‘backstage’ kitchen than in the ‘frontstage’ hall from the 1690s, suggesting their main function was the utilitarian job of telling the time” rather than impressing visitors.⁴⁴ The large number of clocks in rural Kentish kitchens also implies that “both household and farming tasks were being timed.” Baking and brewing could be made more efficient and reliable, and timepieces would facilitate the payment of wages by consistent hours rather than inconsistent days. Moreover, clocks might help coordinate the many activities that took place within the household. To the yeoman, the clock was a symbol of industry. These early uses suggest a precursor to the late eighteenth-century factory’s time discipline.⁴⁵ Industrialisation appropriated these values and elevated them to a new level of precision, to the extent that the machine was the dominant model in the late eighteenth and nineteenth centuries. However, time discipline and the division of labour had an early influence on the domestic environment.

By the late eighteenth and nineteenth centuries, however, the middle class probably understood the manufactory’s time discipline as well as or better than the farm’s. Neil McKendrick describes Josiah Wedgwood’s Etruria as running by precise bells; Wedgwood even devised a primitive clocking-in system.⁴⁶ As recommended for the kitchen, he wrote orders and rules clearly for the workers, as well as the consequences of their violation.⁴⁷ He demanded punctuality and constant attendance at fixed hours, as well as high standards of care, cleanliness, and waste avoidance.⁴⁸ Wedgwood’s workmen, like the best managed servants, “were not allowed to wander at will from one task to another as the workmen did

in the pre-Wedgwood potteries,” and he once claimed that his aim was to “make such *machines* of the *Men* as cannot err.”⁴⁹ Like some mistresses, Wedgwood “doubted his charges’ ability to make their own decisions and as a substitute imposed his own massive authority,” with frequent examinations of the men and their working processes to ensure quality.⁵⁰

In the home, too, discipline was not restricted to the level of the ideal, although undoubtedly it would be more difficult to maintain in a small house with few servants. In the 1920s, housemaid Lavinia Swainbank had to familiarize herself with “The Timetable,”⁵¹ while Leonore Davidoff and Catherine Hall describe the “highly ‘rationalized’ household of an Essex merchant in the 1830s[, which] put time schedules, duties and rewards in writing in an attempt to forestall conflict.”⁵² In 1812, governess Ellen Weeton Stock wrote of her new position with the family of Joseph Armitage, a prosperous wool merchant with four female servants. She noted that “Mrs. Armitage conducts her house in so excellent a manner, that we are as punctual as the clock. I never have to wait of any one; and I take care that no one shall have to wait of me. It is the same with all in the house; breakfast, dinner, tea, or supper, are always within five minutes of the appointed time.”⁵³ Stock’s experience highlights the fact that servants did not work independently, but had to be coordinated. Thomas Webster and Frances Parkes imagined an almost orchestral kitchen: while the cook makes breakfast rolls, the kitchen maid cleans, and the scullion tends the fires.⁵⁴ Another writer declared that “[d]rill is the important factor in discipline” when the staff had to work together, as in the serving of a complex dinner.⁵⁵ Such coordination parallels

the division of labour in manufacturing. Wedgwood practised it at Etruria, Boulton and Watt at Soho, and commentators encouraged it in the first half of the century. Babbage, for instance, stated that the most important principle of the economy of manufactures was “the *division of labour* amongst the persons who perform the work.”⁵⁶

Indeed, the adoption of such management techniques was a larger social trend. Despite the relative scarcity of large-scale industrial employers in London, John Seed argues that the late eighteenth and early nineteenth centuries saw an increasingly dominant pattern of the social relations of production and the accompanying ascendancy of the drive to increase productivity via intensified control of the labour process and the erosion of artisan independence. This was as marked within the “financial services sector” as within the manufacturing sector.... [The City] depended also upon the labour of vast armies of wage workers – dockers, white-collar workers, porters and transport workers of all kinds.⁵⁷

Capitalist property and labour relations dominated almost all sectors, including the home. Domestic work was subordinated to larger business and industrial practices, including the division of tasks and time. Of course, these organizational principles did not apply perfectly. As Babbage noted, division of labour requires “a great demand for its produce; and it requires a large capital to be employed in those arts in which it is used.”⁵⁸ This was a major stumbling block, since the middle class could not afford enough hands – and the volume of each kind of work was not high enough – to divide the diverse tasks efficiently. One guide for

modest young housekeepers stated that highly specified servants were a relic, perhaps of estate houses.⁵⁹ Moreover, division of labour was unnecessary if servants were cheap and willing. Despite the low cost and relative efficiency of outsourcing laundry, the Carlyles' maid Helen did the washing in the copper during her nine-year employment.⁶⁰ Strict schedules were still the ideal, but Linton was correct in observing that they were elusive in practice.

Much has been written on the religious implications of monitoring time. Davidoff and Hall argue that Unitarians and evangelicals gave particular attention to rationality and scheduling; Ann Taylor and her husband Isaac, for instance, kept a rigid timetable, grounded in regular prayer.⁶¹ This religious discipline was closely linked to commercial and industrial success, and Davidoff and Hall observe that many of the principles in Isaac's moralistic advice books for young men – “which stressed regularity and steadiness in business” not unlike Babbage's “uniform[] and stead[y]” machines – could have applied as easily to Ann's publications on women's domestic occupations.⁶² One Unitarian school was even described as “a very perfect machine,” ruled by clocks and bells.⁶³ But while rationality and time-discipline may have been valued among nonconformists, they were soon appropriated by the middling sorts more broadly. The strict eighteenth century dissenting academies drew Anglicans, too, and the cultural integration of timekeeping was a quantification shift crucial for factory operation and railways, for example. Its breadth brought a clearer dissociation from purely religious practice. “Regularity,” wrote a relatively secular household guide in the 1820s, “is the very life and soul of economy.”⁶⁴ For nonconformists, order and its

accompanying business success could easily be put in religious terms, but the elevation of regularity and discipline was important even outside the religious context.

Managing Things

The proper administration of the home was also a physical affair, and in the management of clothing, food, and other household “things” there were strong parallels with industrial organization. Though the phrasing varied, household management guides almost invariably insisted that in every household, “there must be a *place for everything*; and the mistress must see that *everything be kept in its place*.”⁶⁵ The proper execution of this maxim, however, required lists and tables. Checked regularly, inventories, whether of furniture, linen, china, or plate, were useful.⁶⁶ One book even recommended that “Tickets of parchment with the family name, numbered, and specifying what bed it belongs to, should be sewed on each feather-bed, bolster, pillow, and blanket.”⁶⁷ In a larger house, the valet might keep clothing inventories and note the items used each day; one book even included a helpful template.⁶⁸ Management required the authority of writing.

Planning and routine were crucial for the management of things as well as people. Writing bills of fare in advance, for instance, assisted in marketing, and keeping them on file would act as a check on wasted goods or incorrect tradesmen’s books. Every morning, the mistress might inspect the house, concentrating especially on the kitchen and larder, where she would give the day’s orders, assess the provisions, and distribute any special items from the stores.⁶⁹ Household management guides assisted the naïve mistress by providing estimates

of how much tea might be needed for each cup, for example, thus preventing waste.⁷⁰ Measurement facilitated management and budgeting. Any worn-out dusters or cloths, moreover, were to be seen by the mistress before replacement.⁷¹ A book in the store-room might also keep track of when each item was bought, and at what price, to aid in shopping and accounting.⁷² Interactions with outside tradesmen were also to be carefully monitored. As early as 1808 Maria Rundell recommended keeping bread tallies, as well as weighing meat, sugar, and other items to compare with the checks and bills, kept carefully on file. She acknowledged that many women would find this verification and possible confrontation with tradesman awkward, but it was necessary.⁷³ Women had long engaged in savvy marketing. Now, the practice was done at a distance, but Rundell reminded readers that this did not permit disengagement. Those who exhorted good economy had little tolerance for timidity and false refinement.

The industrial and business communities shared these values of order and regularity, as Ann Taylor indicated in her *Practical Hints*: “To do every thing in its proper time, to keep every thing in its right place, and to use every thing for its proper use, is the *very essence* of good management, and is well expressed in one of the Lancasterian establishments, ‘the rule of this school is to have a place for every thing, and every thing in its place.’”⁷⁴ The “Lancasterian establishments” were schools designed by Quaker Joseph Lancaster for labouring-class children. In this highly structured environment, the industrious classes would learn basic reading, writing, and arithmetic before inevitably being pulled away to work.⁷⁵ These schools seemed useful in a society in which even servile or industrial

labour increasingly demanded literacy and discipline. The industrial quality of middle-class management was also obvious in the context of George Dodd's 1843 "Day at a Copper and Lead Factory," part of his larger collection on British industry. He wrote, "To let everything 'have its place and be in its place,' is the simple but valuable principle on which alone the operations of such establishments as these can be kept free from confusion."⁷⁶ Dodd's work was meant for family reading, so his language appealed to householders, but the ideal was clear: the household and the factory could operate on the same principles, and the virtues that elevated Britain to industrial supremacy could also be practised at home. Dodd also emphasized the importance of checking accounts, weighing each piece of metal when it changed hands, and carefully recording which pieces were used for which orders. Moreover, every man's time and the order on which he worked were strictly monitored and easily referenced.⁷⁷ The management of people and things, whether in the factory or at home, were closely related.

In both environments, accounts and records also removed the taint of physical management. One "Lady" argued that surveillance through accounting was preferable to the more intrusive "lock-and-key system." The mistress could better check the cook's efficiency by staying above the fray, "examining each week's bills [rather] than ... poking about every morning into the larder, and searching out abuses."⁷⁸ The relationship would be, superficially at least, more trusting. The mistress could also keep a managerial distance that physically separated the two classes and reinforced the mental/physical distinction between them. Like the capitalist who no longer wandered the shop floor, the lady elevated

herself bodily from the work environment, while still supervising it. Owen, too, practised this separation at New Lanark. Overlookers graded each frame with a colour denoting the quality of the work. Masters would have only to glance at the mill to judge its state. Numbers corresponding to each colour were entered next to the worker's name in a register book as well, completing the schematic system.⁷⁹

But many wives did not have this option, nor did many factory supervisors. Most London industries remained small in scale. In his study of management history, Sidney Pollard writes that in the eighteenth century, the large-scale entrepreneur "began with very limited managerial, clerical or administrative staff: he wrote his own letters, visited his own customers, and belaboured his men with his own walking stick."⁸⁰ The 1851 census confirms that "In some forty-one of the city's most important trades less than two per cent of the workforce were employed in firms with more than fifty workers."⁸¹ Through much of the century, "owners managed and managers owned," and a merchant, for example, might also be involved in manufacturing and banking.⁸² Even Owen, when he took over a Manchester mill early in his career, had to purchase the raw materials, make the machines, keep the accounts, and pay the wages.⁸³ Many wives, too, worked closely with their staff while also demonstrating diverse managerial skills. Jane Carlyle, for instance, could gossip with the butcher's wife or spend a day in and out of the kitchen making marmalade with the servants, but she could also give orders and assemble a budget.⁸⁴ Both middle-class men and women performed a variety of work, and both ideally used order and a sense of confident managerial acumen to cope with this diversity.

Managing Money

Scholars such as Beverly Lemire have commented on the increased onus of budgeting upon the female members of middling households in the eighteenth century.⁸⁵ In part, this drive for budgets had a religious basis. Davidoff and Hall propose that “the force necessary to make men operate within this artificial paper mould primarily came from the dictates of serious Christianity, the fundamental place within Protestantism of ‘casting up accounts’ with God.”⁸⁶ However, popular Christians like Ellis understood the religiosity of budgeting in slightly different terms. Failure to adhere to a budget was a sin because it was “a species of dishonesty” for a Christian woman “to appropriate to her own use, for a month, a week, a day, or an hour, the minutest item of what she had collected for another purpose, trusting to her own future resources for its reimbursement.”⁸⁷ A budget was a promised assignment of money. Departure from it, especially for self-gratification, was the moral equivalent – or worse – of robbing Peter to pay Paul.

More commonly, however, this responsibility was framed in terms of the family’s financial vulnerability. Since the early modern period, more consumption had been passing through the cash nexus, and the middling sorts were built on the growing force of the market.⁸⁸ But their world was one of potential chaos. Meticulous management of domestic funds was crucial in a world of unlimited liability; not until the Limited Liability Act of 1855 and the Joint Stock Acts of 1856 and 1862 were families protected from bad business decisions. In fact, historians note that even after these acts were passed, many trades remained

private and family affairs.⁸⁹ Even under limited liability, if the business collapsed the family might not remain solvent.

Thus, in 1798, Priscilla Wakefield noted that since middle-ranked families were especially susceptible to “a change in circumstances,” what she significantly called “the female partner” must practice good and useful economy.⁹⁰ She should learn to evaluate the quantity of food, linens, and clothing needed for a family; household management guides also provided estimates for struggling wives.⁹¹ Moreover, Wakefield advised, girls must learn arithmetic and bookkeeping not simply for their own budgets, but “as a means of contributing to the success of any business.”⁹² Female responsibility extended beyond the home, and Wakefield also insisted that wives be acquainted with their husbands’ business affairs in case of accident or death.⁹³ Other writers agreed. Upon marriage, argued one, the wife would “superintend the affairs of the man with whose destiny she has united her own; the domestic part of which falls particularly within the sphere of her management.” Marriage was a partnership, and without good household economy “even princely fortunes must fail.”⁹⁴ Proper management, conversely, could secure property, as well as its derivative, propriety. Experts roundly dismissed Charles Dickens’s Dora, who is untenable as David’s long-term wife. “We smile at [her] ignorance,” wrote one writer, “... but how many young ladies marry with as little domestic knowledge[?]”⁹⁵ No woman with less than five thousand a year could afford not to be her own housekeeper.⁹⁶

Historians have unearthed many examples of women whose managerial acumen extended to the family business. Judith Baker, a widowed gentlewoman

from Durham, for example, kept complex ledgers for both her household and the family's alum trade in the mid-eighteenth century, even after her son came of age.⁹⁷ In the 1830s, Louisa Garrett wrote business letters for her nearly illiterate husband, while in the 1840s Catherine Tait managed the family finances as well as the accounts for Rugby school, of which her husband was headmaster.⁹⁸ While Davidoff and Hall argue that the salaried workforce and their families increasingly moved away from the office, perhaps restricting the extent of this overlap, women were expected to maintain this business skill even in an isolated home.⁹⁹ As Lemire puts it, commercial and domestic practices were "conflated into a single epistemology."¹⁰⁰ Although the husband might look over the bills every week or take care of the larger accounts, the wife was responsible for most expenses.¹⁰¹ Partnership and balancing the budget together were acceptable, and one article even implied that good budgeting was for the husband's benefit, since "[m]en like accuracy."¹⁰² Meddling husbands, however, faced social castigation. "In legal disputes between spouses," notes John Tosh, "the husband who removed his wife from the day-to-day management of the household badly prejudiced his case."¹⁰³ In the late 1860s, vicar James Kelly was brought to divorce court. Paranoid and abusive, he recklessly invested money left to his wife in an inheritance and bullied her with demands for "marital authority."¹⁰⁴ Damningly, he displaced Frances as household manager. As the judge put it, she was "entirely deposed from her natural position as mistress of her husband's house."¹⁰⁵ Kelly denied her control over any money and or purchases, which were delegated to a housekeeper. Despite the lack of physical abuse, the judge ruled against him on

the grounds of cruelty. The Englishman was the head of his house, but, as one male observer noted, “A man whose absolute authority is acknowledged, practically as well as theoretically, is very ready to make concessions and to lay aside what at any time he may assume.”¹⁰⁶ Men who meddled in household business were “small-minded.”¹⁰⁷ Proper female budgeting signified partnership.

Budgets so defined the home that Frédéric Le Play used them to categorize families in *Les Ouvriers européens* (1855), while Ernst Engel, director of the Prussian statistical office, argued for their use in a quantitative study of national prosperity in 1857. As Ian Hacking explains, “the statistical average of household budgets would be a fundamental tool of economics, since it could be used as an objective measure of the prosperity of a class or nation.”¹⁰⁸ Political and domestic economy were closely linked; the fiscal health of the home equated with that of business and the nation. Ideally, the budget was so reliable that it could underpin a national study, and guides implied that income could define an exact household structure. James Luckcock’s *Hints for Practical Economy* (1834) prescribed domestic conditions for each income bracket. At £100 per annum, for example, the family could afford 2s. a week for washing, and an occasional servant at 9d. a week. By £200 per annum, they could afford a live-in servant at £6 wages, and eatables increased from 14 to 17s. a week.¹⁰⁹ Luckcock, like Wakefield, encouraged girls to study arithmetic, and noted that through budgeting, the wife would “be taught to feel an interest in her joint prosperity with her husband.” Proper budgeting, in which self-denial was usually the price of stability, mitigated “the precarious and fluctuating chances” of speculation in “trade, or land, or

building, or mortgage, or canals.”¹¹⁰ Luckcock even claimed that through diligence, economy, and good management he had risen from a family making a modest £80 per year to possessing a “sufficient competency.”¹¹¹ Budgeting was a manifestation of the values that led to success, and indeed, the financial and class insecurities that supported domestic book-keeping were also evident outside the home. A writer on accounting for solicitors, for instance, believed that many bankruptcies could be chalked up to bad accounting.¹¹² The want of a proper accounting system was, moreover, shameful “amongst those who are connected with so much of the business of this country, and of ‘this great city, which is the centre of the wealth and enterprise of the world, and which regulates the commercial affairs of almost every country on the face of the earth.’”¹¹³ Budgeting was a matter of domestic, professional, and national concern.

This fiscal management was also closely connected to time management. In addition to his cookery books, Kitchiner wrote *The Housekeeper’s Ledger* (1825), a text that included “Tom Thrifty’s Essay on the Pleasure of Early Rising.” Budgeting and time were intimately linked, and his recommended accounting practice operated on a weekly schedule. The cook examined the weekly bills on Monday and presented them to her mistress on Tuesday morning. The mistress filed these and paid them every four weeks.¹¹⁴ This plan, Kitchiner declared, would cost the mistress only one hour per week, a small investment of time for “Order and Economy [which] are the Basis of Comfort and Independence.”¹¹⁵ The link between budgeting and scheduling also applied to the factory, where Michael Chatfield notes that “the regularizing of accounts [by

calendar months, quarters, etc.] forced the natural rhythm of work into uniform reporting segments just when machine techniques made operational time more important than ever before”; artificial light, moreover, allowed for both precise and consistent work times.¹¹⁶ The same was true, although perhaps to a lesser degree, of the machine-like home.

A time of strain reinforced the depth of these business and management values among the middle class. In the last quarter of the nineteenth century Britain entered into a period of economic difficulty, and in 1877 Mrs Caddy’s *Household Organization* replied to these financial straits.¹¹⁷ Fully engaged in global affairs, Caddy remarked on the Turkish national debt, Russian stocks, Egyptian securities, and commercial failures in England, before moving seamlessly to the domestic solution for those “suddenly reduced from affluence to comparative poverty.”¹¹⁸ Quality of life need not suffer, and the economy might rebound, if Britons “would arrange our dwellings in accordance with principles of true economy Every family might be its own Economical Housekeeping Company (Limited), comprising in itself its shareholders and board of directors, realizing cent. per cent. for its money, because £200 a year would go as far as £400.”¹¹⁹ For Mrs Caddy, businesses exemplified management. Stretching the household budget was analogous to improving productivity. In arguing that mistresses must do more work, she resorted to another economic metaphor: “We have tried to keep ourselves as sleeping partners in the domestic concern; we have derived profit from our money invested in service, and we find that this is no longer a profitable investment.”¹²⁰ This “profit” was social capital, the luxury of passing drudgery on

to the servants. Now, however, public “credit” was more firmly secured not by “outward appearances,” but by “seeming strong enough to dispense with artificial support.”¹²¹ In accordance with rational commerce, money’s management, rather than its display, was most admired.

Davidoff and Hall note that the “valuation of actions and materials in monetary terms was regarded as a quintessentially masculine skill and prerogative”; its practice in the home, then, is potentially problematic.¹²² By the mid-nineteenth century budgeting sounded threatening to some, and in the late 1850s, Dinah Craik apparently heard criticism from men who imagined that female accounting might mean a frightening capacity for independence. She reassured them that, considering “the extreme difficulty there always is in balancing Mrs. Smith’s housekeeping-book, or Miss Smith’s quarterly allowance, I think, my dear Paternal Smith, you need not be much afraid lest this loud acclaim for ‘women’s rights’ should ever end in pushing you from your stools, in counting-house, college, or elsewhere.”¹²³ R.K. Philp, in fact, saw household management as a way of directing women’s energies productively, and away from political agitation.¹²⁴ Perhaps imagining a golden age of estate management and proper domestic engagement, many commentators depicted budgeting as conservative. One guide celebrated women “taught to relish, as in days of yore, the more rational, solid, and lasting pleasures, of a social and comfortable home,” including “the science of practical economy – the business of examining and keeping accounts.”¹²⁵ *Punch* similarly described the Model Daughter as one who knew nothing of “‘Woman’s Mission’ . She studies housekeeping, is perfect in the

common rules of arithmetic She checks the weekly bills, and does not blush if seen in a butcher's shop on a Saturday."¹²⁶ So while budgeting and management were signs of women's engagement with the commercial world, they also, paradoxically, indicated steady and modest devotion to the home.¹²⁷

Although historically there was a long tradition of master and steward accounting, which aided in evaluating the estate from year to year, double entry bookkeeping was first codified among Renaissance merchants, so it had always savoured of commerce.¹²⁸ By the eighteenth and nineteenth centuries, as the traditional history goes, its abstraction clarified the aim and practice of business as the depersonalized, "rationalistic pursuit" of profit, while its inherent "balancing features and mathematic logic, together with manufacturing capitalism, helped quantify, systematize, and control business affairs, and gave a new rationality to resource allocation." These points have been deservedly criticized, and there is evidence that the books often blended business and personal assets, but accounting certainly facilitated management.¹²⁹ At Soho, the supervisors kept accounts and statistical records to minimize waste and maximize efficiency.¹³⁰ As the business expanded, written records were increasingly crucial to its smooth and efficient operation.¹³¹ Cost accounting made its debut in multi-step factories at the turn of the nineteenth century to help determine prices and wages; merchants, who assumed that everything was bought and sold whole, did not need to factor in the cost of transformations.¹³² At home, however, costs are based largely on transformations: dirty to clean, fuel to fire, ingredients to meals. Thus, though some social climbers saw book-keeping as old-fashioned and dowdy, it could also

be recast in the modern and powerfully masculine terms of cost accounting. For Caddy, the same techniques that determined hourly wages and equipment modifications in factories would govern the home. Servants would be streamlined, and she referred to new technologies as “investments.”¹³³ Other books stated that it was cheaper to buy goods wholesale and carefully calculate to the day. Quantitative evaluation was so engrained that an ad for a peeler, for instance, boasted that “a saving of 25 per cent is effected over an ordinary knife.”¹³⁴ Warren summarized this analytical approach: “A manufacturer makes his experiments, and, if success crown his efforts, he endeavours to produce an article at the lowest possible cost consistent with excellence. The same principle should be carried out in the kitchen.”¹³⁵ Accounting’s advantages in the workplace – preventing fraud, determining solvency and credibility, minimizing costs, and generally facilitating management – applied at home, too.

General Business Values and Responses

Eliza Warren’s *Comfort for Small Incomes* included a chapter entitled, “How a Great Fortune was made out of Bread Crusts.”¹³⁶ It is the story of a self-made industrialist who begins by collecting and selling bread crusts. Through shrewd re-investment in his business, combined with “economy, observation, and industry,” he becomes a successful breadcrumb manufacturer. Throughout his establishment, the storyteller notes admiringly, “the greatest order and cleanliness prevails, for the master is always present, and his eye, be sure, does more work than both his hands.”¹³⁷ The chapter ends with a suggestion that the household “begin a manufactory on a small scale” by making use of its own bread scraps.¹³⁸

Although Warren's story might come as cold comfort to the struggling housewife, the principles are familiar. The home was to use the manufactory as a model, and great business success could originate in domestic economy. The same values were appreciated in both settings.

Books like Warren's, which also gave precise instructions about how to put "economy, observation, and industry" into effect, were one of many sources of business and industrial knowledge for nineteenth-century women. *Enquire Within*, probably aiming for the grey area between working and middle class, tucked the "Habits of a Man of Business" among the recipes and remedies. These included, "Does nothing carelessly or in a hurry" and "Keeps everything in its proper place," as well as "Prefers short credits to long ones; and cash to credit at all times." The good man of business wrote rather than recalled, kept copies of every important letter or invoice in tidy files, examined his books regularly, and lived within his income.¹³⁹ Any female reader would immediately recognise a household management counterpart, almost verbatim, for each line. Perhaps such guides inspired the farmer's daughter married to a bank manager, who believed that childrearing must be precisely scheduled. Even for a toddler stringing beads, "there should be a degree of perfectness and even something approaching to business habits encouraged and expected even in these little amusements to give a worth and interest to them. Perfect play is the anticipation of perfect work."¹⁴⁰

For many families, moreover, the business and home were still strongly linked. John Tosh, citing Hall, notes that "as late as 1851 middle-class families who lived away from the workplace were still outnumbered by those who lived

over the shop or immediately adjacent to their work premises.”¹⁴¹ Girls and women might be familiar with or even help run the family brewery, foundry, or surgery, for example. Stana Nenadic has also observed what she calls “the visibility of manufacturers” to the middle-class community. Railways, gas works, and factory chimneys could not be ignored, and industrial exhibitions allowed the public to see new machines and products. Many manufacturers, moreover, “were happy to accommodate the middle-class desire to see what went on in their factories.” The factory was a spectacle, “a stage for display; it was usual to have regular, advertised times of visiting, and notables were conducted on well-established tours of large model factories.”¹⁴² Ellis even feared that innovation was becoming too spectacular; she encouraged women to contemplate the business and ingenuity of their times in the context of the Creator’s power.¹⁴³

Women might also take famous figures as role models. In *Character*, Samuel Smiles referred women to the female counterparts of familiar great men. George Washington’s mother, for instance, was “an excellent woman of business,” and Smiles used her to enter into a discussion of business values that were “not only compatible with true womanliness, but [were] in a measure essential to the comfort and well-being of every properly-governed family.” Smiles explained that the management of a home “is as much a matter of business as the management of a shop or of a counting house. It requires method, accuracy, organization, industry, economy, discipline, tact, knowledge, and capacity for adapting means to ends.”¹⁴⁴ Business embodied, in Smiles’s estimation at least, all that was best and most useful in English character for both sexes. Both business

and home environments could also exemplify what another writer called, in the domestic context, “intelligent industriousness.”¹⁴⁵ The woman was an informed and analytical professional. Banks demonstrated this by applying her “reasoning faculties” to develop a “scientific method of dishwashing,” for example, or efficiently sweeping the stairs *before* the hall at the bottom.¹⁴⁶

It is only on the surface that these goals are incompatible with the home’s moral import. Smiles believed that women’s primary goals should be peace and comfort, but these were achieved through good management. Ellis expressed a feeling of straddling competing identities, although she concluded that woman’s natural qualities facilitated the science of good housekeeping:

[T]here is a philosophy in this science, by which all their highest and best feelings are called into exercise.... Not only must a constant system of activity be established, but peace must be preserved, or happiness will be destroyed. Not only must elegance be called in, to adorn and beautify the whole, but strict integrity must be maintained by the minutest calculation as to lawful means, and self, and self-gratification, must be made the yielding point in every disputed case. Not only must an appearance of outward order and comfort be kept up, but around every domestic scene there must be a strong wall of confidence, which no internal suspicion can undermine, no external enemy break through.¹⁴⁷

Morality was not at odds with management. Order and regularity buttressed the domestic walls. By confronting difficult staff, corrupt tradesmen, and financial

insecurity, women protected the moral core of the home. The separate spheres persist, not by the exclusion of the outside world, but by its management.

And indeed, the reward of good management, stated again and again, was comfort. As John Crowley explains, the eighteenth-century consumer revolution “developed a culture of comfort that synthesized *comfort*’s new physical meanings with traditional ones of moral support.” By 1800, material comfort “had developed into a culture to be learned and demonstrated as a sign of social progress,” crucial to the formation of the middle class.¹⁴⁸ Crowley’s focus is largely domestic consumption, but he also acknowledges the importance of values and behaviours, which might include proper household management. By providing material and financial order and well-being, women guaranteed a more abstract emotional comfort. They might please a methodical husband or simply an overworked one who did not wish to be annoyed with the domestic troubles.¹⁴⁹ The duality of women’s tasks rested in the ambiguity of the term “comfort,” with physical and moral meanings, as in the epigraph to this chapter.

Conclusions

At times, the middle class had other ideals. Guides bemoaned the teaching of “fashionable accomplishments” at the expense of solid skills,¹⁵⁰ and Rundell worried that “We sometimes bring up children in a manner calculated rather to fit them for the station we wish, than that which it is likely they will actually possess.” Middle-class girls, she insisted, must prepare for “employment.”¹⁵¹ Domestic management was not to be too evident, smacking of the labour that the middle classes were, in many cases, so barely above. But its proper deployment,

and thus the family's status, was evident to all. Fashionable accomplishments would not be shown off to any advantage in an ill-managed home, an overwhelming sign of idleness, irrationality, immorality, and probably eventual ruin. Societal values of commerce and industry superseded stylish talents.

Historians such as William Reddy have suggested that class be seen not as a position, but as a relationship.¹⁵² This relationship, in turn, depends on a disparity of power. In the context of both the home and the broader nineteenth-century society, this power was manifested through knowledge and the application of systematic discipline. As Michel Foucault has argued, factors such as a floating population, increased number of people to be supervised, and more apparatuses for production drove the establishment of disciplinary mechanisms and structures in the seventeenth and eighteenth centuries.¹⁵³ The domestic space, intriguingly, faced many of the same factors, and the discipline established therein in the eighteenth and nineteenth centuries may be part of what Foucault calls a general "disciplinary society."¹⁵⁴ Consistency and regulation, expressed in disciplinary mechanisms such as writing, timetabling, and surveillance, are crucial for the establishment of power, and were clearly practised in the nineteenth-century home.¹⁵⁵ Surveillance in particular is necessary to create a machinery or system of power, linked to broader economic ends, such as, perhaps, financial stability and middle-class status.¹⁵⁶ Foucault has also famously discussed surveillance in the context of the panopticon. Key to its operation is "irregular and constant inspections."¹⁵⁷ Household guides emphasized the domestic equivalent. "Few houses can go on well unless the mistress or her representative visits the

kitchen at least once every day, and that not always at the same hour,” wrote one commentator.¹⁵⁸

Discipline’s power, Foucault continues, “is one of analysis.”¹⁵⁹ The analytical managerial operations prevalent in the home paralleled the operations prevalent among the increasingly powerful commercial and industrial classes in the late eighteenth and nineteenth centuries, what has elsewhere been called “scientific management.”¹⁶⁰ Whether in capitalist factories, commercial bookkeeping, scientific discovery, or household governance, the social technologies of rigid discipline, the division of labour, order, timekeeping, and bookkeeping seemed to offer the key to progress and success, and the avoidance of the secular and religious sins of idleness and waste. The ruling class’s knowledge and rational thinking facilitated its consolidation of financial and social capital and ensured a dominant relationship with those below them. While many middle-class women may have continued to participate in the domestic labour of their homes, it was their analytical distance from this labour that separated them from their staff. This was the same analytical authority that successful men applied in their workplaces. Davidoff and Hall have argued that strict time management can in fact be less efficient, while much domestic labour, such as scrubbing every day, was an issue of moral righteousness rather than practical necessity.¹⁶¹ In fact, this discipline and regularity worked to divide the middle class from those around them and guarantee their property and propriety. Good management, whether of people, time, goods, or money, whether at work or at home, secured middle-class status.

Conclusion

“... the power to be at once practical and aesthetic, the careful worker-out of minute details and the upholder of sublime idealism – the house-mistress dispensing bread and the priestess serving in the temple.” – Eliza Lynn Linton¹

When Eliza Lynn Linton enumerated some of the characteristics of “true womanliness,” as quoted above, she was identifying a Victorian paradox. The middle-class woman was to be a paragon of virtue and morality, but also a knowledgeable and rational organizer. In earlier centuries, women’s domestic skills were, perhaps, taken for granted, but in the nineteenth century middle-class household management was increasingly professionalized, heavily influenced by the culture of science, technology, and rationality in the broader industrial society. Alongside *domestic economy*, an older term traditionally referring to the management of household resources (particularly money but also food, clothing, and even labour), were the newer terms *domestic science* and *household science*. A relatively early use of *domestic science* was as the title of an 1854 ditty in *Punch*, used with a heavy dose of sarcasm:

Said a Chemist to his wife,

“What is sugar, dearest life?

That is more than you can tell me, I’ll be bound.”

“Oh!” said she, “you stupid man,

Get along! – of course I can;

Fourpence, fivepence, sixpence halfpenny a pound.”²

The tension between the unfolding sciences and the traditional understanding of a domestic role led to this ditty, but the poem was reacting against a larger

movement. There was no sarcasm in titles such as Catharine E. Beecher and Harriet Beecher's Stowe's *The American Woman's Home: Or, Principles of Domestic Science*, or R.K. Philp's *The Reason Why: Domestic Science*. The term could mean the science of household management, as well as the application of science to the home. As this thesis has demonstrated, the two overlapped heavily in the nineteenth century. With the quantification of cookery, the profusion of chemical leaveners, and concern about range flues and gas lighting, a household manager needed to know something of chemistry and physics, as the sub-title of Edward L. Youmans's *Hand-book of Household Science* suggested: "A Popular Account of Heat, Light, Air, Aliment, and Cleansing, in their Scientific Principles and Domestic Applications."³ Even less explicitly scientific tasks like budgeting and scheduling were conducted with a new spirit of rationality and precision. The cultural gravitas of *science*, associated with factual modes of thought, gave the home its order and the mistress her authority.

This increasingly specialist practice might be seen as domestic professionalization, in that it required special education and skills based on theoretical knowledge.⁴ Women, of course, had always been experts in many aspects of cookery, cleaning, and housekeeping in general, but now guides prescribed the comprehension of the abstract principles behind these tasks, a movement away from sensory tests toward fact and the "reason why." As Deborah Valenze has argued of the late eighteenth-century English dairy industry, a feminine art was replaced by a masculine knowledge, both in terms of business and managerial acumen and in men's high scientific, rather than functionally

empirical, understanding of the process.⁵ To borrow a distinction from Jan Golinski's study of late eighteenth and early nineteenth-century chemistry, experience became expertise.⁶ Women continued to write cookbooks and management guides, but much of their knowledge was supposedly derived from masculine research, and their models were the masculine values of the industrial and entrepreneurial worlds. But while the professionalization of dairying excluded women from positions of authority, in the middle-class home the mistress was not deposed. Instead, she combined her experience with expertise to enact a professional identity.

Burton J. Bledstein argues that professionalization encompassed an "ethic of service," an ethic that helps reconcile Linton's two aspects of womanliness.⁷ More importantly, the professional "grasped the concept behind a functional activity, allowing him both to perceive and to predict those inconspicuous or unseen variables which determined an entire system of developments." He "penetrated beyond the rich confusion of ordinary experience, as he isolated and controlled the factors, hidden to the untrained eye, which made an elaborate system workable or impracticable, successful or unattainable."⁸ He was, in other words, analytical, and he had specialized systematic knowledge. The result of his labours was apparently effortless. "Written documents, facts, and authorities," moreover, "supported every disinterested decision."⁹ The managerial woman, too, might surround herself with recipes, schedules, and budgets. She was supposed to grasp, as shown in chapters 1 and 2, the science of domestic events from rising bread to plumbing systems. As one guide explained, just as the man of business

studied a problem before he embarked on its resolution, the managerial woman did not “allow herself to be satisfied with her own willingness to do her duty, without a diligent and persevering investigation of what are the most effectual means by which it can be done.”¹⁰ The professional woman adhered to a Victorian middle-class gospel of reason and efficiency, the same gospel that defined her husband’s work. Her inability to manage technology, money, or workers would disqualify her from a bourgeoisie founded upon these skills. The professional was also a normaliser, recognizing problems and controlling her environment, and thus assuring her status.¹¹

The 1851 census confirmed the significance of the domestic role, as the Registrar General created a new class comprising “a large number of the population that have hitherto been held to have no occupation; but it requires no argument to prove that the *wife*, the *mother*, the *mistress* of an *English Family* – fills offices and discharges duties of no ordinary importance.”¹² This classification has been interpreted as segregation, a condemnation to domestic life, but it was also empowering, a sign of women’s professionalization.¹³ Heading a household was one of fourteen “definite occupations,” alongside learned professionals, scientists, booksellers, tradesmen, and miners. Although the census acknowledged that many women, particularly the wives of innkeepers, farmers, and small shopkeepers, were significantly employed in other occupations, it declared that these families suffered, since “[t]he duties of a wife, a mother, and a mistress of a family, can only be efficiently performed by unremitting attention.”¹⁴

The census thus denied, while making clear, the fact that domestic professionalization was largely an ideal, significantly constructed and reproduced by authorities like William Kitchiner and Mrs Beeton. Monica F. Cohen agrees, noting that the fad for wearing chatelaines in the second half of the century was a sign “that the fact of housekeeping had turned into an idea of housekeeping”;¹⁵ the chatelaine was a pre-industrial tool of little practical necessity for Victorian women. Diaries and account books, moreover, are a reminder that many women did not always adhere to prescriptive advice. Jane Carlyle, for one, hated her “subterranean” kitchen, which was run on less than textbook principles.¹⁶ But all of this is not to say, as some scholars have, that true rationalization of the home was not underway. In his seminal and authoritative work, *Mechanization Takes Command* (1948), Siegfried Giedion argues that the proliferation of mechanical appliances in the home, as well as a change in attitudes regarding the home as an increasingly mechanical place, was not established until after the First World War.¹⁷ But this thesis has shown that this was not the case. In fact, the mechanical metaphor was applied to the home (and critiqued) in the first half of the nineteenth century, part of a massive cultural reorientation toward the machine. There was also a change in epistemology, privileging quantification and fact over sensory or intuitive knowledge. The conventional history of the domestic science movement identifies its origins at an 1878 Manchester congress, where, as Nicola Humble explains, “delegates proposed the teaching of the subject in schools, arguing that a basic knowledge of chemistry and biology was relevant to the proper practice of feeding a family and that the new subject should also embrace

cleanliness, thrift, health, childcare and needlework, as well as cooking.”¹⁸ This history, however, must be revised to account for the changes in housework that were already underway. Some of the guides this thesis has quoted might never have been opened, but they signified the tacit expectation that in addition to moral goodness, the middle-class mistress would have a clear grasp of scientific, functional principles and how to apply them to her home. The *chatelaine* may be read as women’s congruous attempt to legitimate their work with the long and noble tradition of female management. Indeed, a bundle of keys appeared on the cover of an otherwise scientifically oriented housekeeping guide.¹⁹

These changes were a sign of the home’s participation in the industrial process, a participation that affected women’s perception and ways of understanding, as in the case of quantified and scientific cookery, as well as their evaluation of the home’s material needs and operation. It also changed their behaviours and ideals of management and interpersonal relations. At both conscious and unconscious levels, these changes defined the middle class and separated them from those around them. Nineteenth-century England was heavily oriented toward science and technology, and the middle class was making its living in business and industry, where numeracy, technology, rationality, and order were crucial. It was only fitting that the home, too, should take part in, display, and attempt to benefit from these principles. Women, as we have seen, brought their own meanings and criticisms to science, technology, and management values; but ultimately, just as their male counterparts did in their own world of work, they drew authority from them.

Endnotes

Introduction

¹ Michel de Certeau, *The Practice of Everyday Life*, trans. Steven F. Rendall (Berkeley: University of California Press, 1984), 108.

² John Ruskin, *Sesame and Lilies. Two Lectures Delivered at Manchester in 1864*, 2nd ed. (London: Smith, Elder & Co., 1865), 148.

³ Ruskin, 101.

⁴ See Amanda Vickery, "Golden Age to Separate Spheres? A Review of the Categories and Chronology of English Women's History," *The Historical Journal* 36, no. 2 (1993): 383-414 for an excellent discussion of the literature. See also Barbara Welter, "The Cult of True Womanhood: 1820-1860," *American Quarterly* 18, no. 2, part 1 (1966): 151-174 for an exemplary look at the pious, submissive Victorian woman.

⁵ Elizabeth Langland, *Nobody's Angels: Middle-Class Women and Domestic Ideology in Victorian Culture* (Ithaca: Cornell University Press, 1995), 9, 11.

⁶ See, for example, Herbert Sussman, *Victorian Technology: Invention, Innovation, and the Rise of the Machine* (Santa Barbara, CA: Praeger, 2009).

⁷ The middle of the century receives special attention: industrialisation was in force, but electricity, packaged food, germ theory, and other characteristics that define modern housekeeping were only in their infancies.

⁸ Christina Hardyment, *From Mangle to Microwave: The Mechanization of Household Work* (Cambridge: Polity Press, 1988), 21.

⁹ R[alph] W[aldo] Emerson, *English Traits*, new ed. (London: G. Routledge & Co., 1857), 47-48; also quoted in Hardyment, 21.

¹⁰ Maxine Berg, introduction to *Technology and Toil in Nineteenth-Century Britain* (London: CSE Books, 1979), 10.

¹¹ *Official Descriptive and Illustrated Catalogue of the Great Exhibition of the Works of Industry of all Nations* (London: Royal Commission, 1851), 75.

¹² Charles Babbage, *On the Economy of Machinery and Manufactures* (London: Knight, 1832), 3.

¹³ *Journal of Domestic Appliances* (1 September 1882), quoted in Hardyment, 22. Even London, generally thought of as a commercial centre, contained a substantial body of manufacturers, securing the social impact of this group. John Seed observes that while London may "not have been a centre of heavy industries associated with industrialization – textile mills, iron and steel production, coal-mining – it pioneered the development of mechanical engineering in the 1820s and remained second only to Lancashire as an engineering centre until the 1870s." It was also a centre for metal-working, tool-making, chemical manufacturing, shipbuilding, brewing, paper-making, printing, furniture, boot and shoe-making, tanning, and textile manufacturing. "In 1861 around one-quarter of the male population over ten years of age were working in such manufacturing activities in London – compared to around 15 per cent in commerce, clerical work, retail and

distribution” (“From ‘Middling Sort’ to Middle Class in Late Eighteenth- and Early Nineteenth-Century England,” in *Social Orders and Social Classes in Europe since 1500: Studies in Social Stratification*, ed. M.L. Bush [London: Longman, 1992], 126).

¹⁴ John Kenneth Galbraith, *The New Industrial State*, 2nd ed., rev. (Boston: Houghton Mifflin, 1971), 12.

¹⁵ William D. Andrews and Deborah C. Andrews, “Technology and the Housewife in Nineteenth-Century America,” *Women’s Studies* 2 (1974): 315.

¹⁶ Margaret R. Hunt, *The Middling Sort: Commerce, Gender, and the Family in England, 1680-1780* (Berkeley: University of California Press, 1996).

¹⁷ Leonore Davidoff and Catherine Hall, *Family Fortunes: Men and Women of the English Middle Class 1780-1850*, rev. ed. (1987; London: Routledge, 2002), 235.

¹⁸ Peter Cunningham, *London in 1857* (London: John Murray, 1857), 204-5. The price was £35 per annum. As Sidney Pollard explains, the new learning had two broad groups of subjects: “there were the ‘commercial’ subjects, including modern languages (significantly called, in many prospectuses, ‘commercial languages’), book-keeping, shorthand, commercial law and practices of the chief countries, including their taxation systems, political economy, commercial calculations, geography, and navigation. Secondly, there were the scientific and technological subjects, including mathematics, pure and applied, physics, chemistry, anatomy, botany, and zoology, engineering and surveying, and astronomy” (*The Genesis of Modern Management: A Study of the Industrial Revolution in Great Britain* [London: Edward Arnold, 1965], 107-8).

¹⁹ Cunningham, 195.

²⁰ G.W. Roderick and M.D. Stevens, “Scientific Education in England and Germany in the Second Half of the Nineteenth Century,” *The Irish Journal of Education* 16, no. 1 (1982): 64-65.

²¹ Cunningham, 196.

²² Roderick and Stevens, 65.

²³ Roderick and Stevens, 78.

²⁴ Lyon Playfair, “The Study of Abstract Science Essential to the Progress of Industry,” in *British Eloquence: Literary Addresses*, 2nd series (London and Glasgow: Griffin, 1855), 86; also quoted in Roderick and Stevens, 80.

²⁵ Babbage, 379, 384.

²⁶ W[illiam] H. Brock, “The Development of Commercial Science Journals in Victorian Britain,” in *Development of Science Publishing in Europe*, ed. A.J. Meadows (Amsterdam: Elsevier Science Publishers, 1980), 95, quoted in Bernard Lightman, “‘The Voices of Nature’: Popularizing Victorian Science,” in *Victorian Science in Context*, ed. Bernard Lightman (Chicago: University of Chicago Press, 1997), 191.

²⁷ Lightman, 191.

²⁸ Barbara T. Gates, “Ordering Nature: Revisioning Victorian Science Culture,” in *Victorian Science in Context*, ed. Bernard Lightman (Chicago: University of Chicago Press, 1997), 179.

- ²⁹ Roger Cooter and Stephen Pumphrey, "Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture," *History of Science* 32 (1994): 254-55.
- ³⁰ Priscilla Wakefield, *Reflections on the Present Condition of the Female Sex; with Suggestions for its Improvement* (London: J. Johnson and Darton and Harvey, 1798), 91-92.
- ³¹ Ann B. Shteir, "Elegant Recreations? Configuring Science Writing for Women," in *Victorian Science in Context*, ed. Bernard Lightman (Chicago: University of Chicago Press, 1997), 240, 245.
- ³² "Royal Adelaide Gallery," *The Servants' Magazine* 6 (1843): 63-67, 75-78.
- ³³ James Walvin, *English Urban Life, 1776-1851* (London: Hutchinson, 1984), 59.
- ³⁴ Mrs Isabella Beeton, *The Book of Household Management*, facsimile 1st ed. (1861; London: Jonathan Cape, 1969), 1.
- ³⁵ Margaret Posenby, "Ideals, Reality and Meaning: Homemaking in England in the First Half of the Nineteenth Century," *Journal of Design History* 16, no. 3 (2003): 203; Nicola Humble, introduction to *Mrs Beeton's Book of Household Management*, by Isabella Beeton (Oxford: Oxford University Press, 2000), xxxi.
- ³⁶ John Burnett, *A Social History of Housing, 1815-1985* (London: Methuen, 1986), 14; and Catherine Hall, *White, Male and Middle-Class: Explorations in Feminism and History* (Cambridge: Polity Press, 1992), 175. R. Dudley Baxter, *National Income. The United Kingdom* (London: MacMillan and Co., 1868), estimates the middle and upper classes combined at above 20 percent (8, 15).
- ³⁷ B. Seebohm Rowntree, *Poverty: A Study of Town Life* (London: MacMillan & Co., 1901), 14. For the three-servant model, see J.A. Banks, *Prosperity and Parenthood: A Study of Family Planning among the Victorian Middle Classes* (London: Routledge and Kegan Paul, 1954), 77.
- ³⁸ Seed, 115.
- ³⁹ Baxter, 81.
- ⁴⁰ See Patricia Branca, "Image and Reality: The Myth of the Idle Victorian Woman," in *Clio's Consciousness Raised: New Perspectives on the History of Women*, ed. Mary. S. Hartman and Lois Banner (New York: Harper Colophon, 1974), 182; and Stefan Muthesius, *The English Terraced House* (New Haven: Yale University Press, 1982), 44.
- ⁴¹ Deborah Valenze, *The First Industrial Woman* (New York: Oxford UP, 1995), 169.
- ⁴² Davidoff and Hall, 23; Baxter, 23.
- ⁴³ Baxter, 35.
- ⁴⁴ Nicola Humble, *Culinary Pleasures: Cook Books and the Transformation of British Food* (London: Faber and Faber, 2005), suggests the number of middle class tripled between 1851 and 1871 (13); Seed, 117.
- ⁴⁵ Thad Logan, *The Victorian Parlour* (Cambridge: Cambridge University Press, 2001), 25.
- ⁴⁶ Alison C. Kay, "Retailing, Respectability and the Independent Woman in Nineteenth-Century London," in *Women, Business and Finance in Nineteenth-*

Century Europe: Rethinking Separate Spheres, ed. Robert Beachy, Béatrice Craig, and Alistair Owens, 152-66 (Oxford: Berg, 2006); Hannah Barker, *The Business of Women: Female Enterprise and Urban Development in Northern England, 1760-1830* (Oxford: Oxford University Press, 2006).

Chapter 1: The Scientization of Cookery

¹ A version of this chapter has been submitted for publication.

² Julia McNair Wright, *The Complete Home: An Encyclopedia of Domestic Life and Affairs* (Philadelphia: J.C. McCurdy & Co., 1879), 137.

³ The *Oxford English Dictionary*'s first recorded use of "domestic science" is 1897 (s.v. "domestic"). However, books like R.K. Philp's *The Reason Why: Domestic Science* (London: [Houlston and Stoneman?], 1869) and John Timbs's *Knowledge for the People*, part 1, *Domestic Science* (Boston: Lilly & Wait, 1831), indicate a significantly older date. It should also be noted that the term "science" had, by this point, come to carry the meaning of "useful, empirically generated knowledge" (William H. Brock, "Advancing Science: The British Association and the Professional Practice of Science" [1981], repr. in *Science for All: Studies in the History of Victorian Science and Education* [Aldershot, Hampshire: Variorum, 1996], II: 90.).

⁴ [Philp], *The Reason Why: Domestic Science*, vi.

⁵ [Philp], *The Reason Why: Domestic Science*, xiii.

⁶ [Philp], *The Reason Why: Domestic Science*, iii. Many of Philp's books were probably aimed largely at the upper working classes (Malcolm Chase, personal communication). However, his work probably transcended class boundaries, and both he and more clearly middle-class writers attempted to share scientific knowledge with women in their homes.

⁷ David Knight, *The Age of Science: The Scientific World-View in the Nineteenth Century* (Oxford: Basil Blackwell, 1986).

⁸ Susan Sheets-Pyenson, "Popular Science Periodicals in Paris and London: The Emergence of a Low Scientific Culture, 1820-1875," *Annals of Science* 42 (1985): 553.

⁹ Sheets-Pyenson, 562.

¹⁰ Jan Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992), 194; Greg Myers, "Fictionality, Demonstration, and a Forum for Popular Science: Jane Marcet's *Conversations on Chemistry*," in *Natural Eloquence: Women Reinscribe Science*, ed. Barbara T. Gates and Ann B. Shteir (Madison: University of Wisconsin Press, 1997), 48.

¹¹ [R.K. Philp], *The Housewife's Reason Why* (London: [Houlston and Wright?], [1859]), iii. Philp's *Corner Cupboard*, for example, nonchalantly followed a recipe for cheesecake with an answer to "Has the Moon an Atmosphere" and addressed scientifically oriented household questions such as "Does cold radiate as well as heat?" ([R.K. Philp], *The Corner Cupboard: A Family Repository* 1

[1858]: 157, 104) A series for the *Englishwoman's Domestic Magazine* similarly examined the basic science of earth, air, fire, and water (“‘Earth, Air, Fire, and Water;’ or, Domestic Science from an Old Text,” 11 parts, *Englishwoman's Domestic Magazine* 37-48 [1868]). Ann B. Shteir has also written extensively on botanizing women. See, for example, *Cultivating Women, Cultivating Science: Flora's Daughters and Botany in England, 1760-1860* (Baltimore: Johns Hopkins University Press, 1996).

¹² Roger Cooter and Stephen Pumfrey, “Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture,” *History of Science* 32 (1994): 248-49.

¹³ While “economy” had long been understood as having a domestic meaning, the same was not true of “science,” the application of which to the home was a leap that would not occur until perhaps the mid-nineteenth century, well after scientific principles were beginning to be established there.

¹⁴ Gilly Lehmann, *The British Housewife: Cookery Books, Cooking and Society in Eighteenth-Century Britain* (Blackawton: Prospect, 2003), 384, and Arnold Whitaker Oxford, *English Cookery Books to the Year 1850* (London: Oxford University Press, 1913). The latter book shows uneven growth for the nineteenth century, but the number of cookbooks published each decade is generally higher than in the eighteenth century.

¹⁵ Matthey Family, *Receipts for Kitchen and Household Use c. 1750-1900*, Wellcome MS 3498, in *Women and Medicine: Remedy Books, 1533-1865*, ed. Sara Pennell, reel 19 (London: Wellcome Institute for the History of Medicine, 2004), 32, 112. Earlier contributors to the Matthey receipt book also apparently added to one another's recipes, a practice largely gone by the end of the book. However, at least one cookbook professed to have taken many receipts “from family MSS,” which was supposed to make them accessible and trustworthy (A Lady, *Murray's Modern Cookery Book: Modern Domestic Cookery* [London: John Murray, 1851], iii). The professionalization and normalization of cookery was clear at the opening of the National Training School for Cookery in South Kensington in 1874, which soon came to act as a Normal School for cooking instructors (see Eliza A. Youmans, preface to the American ed. of *Lessons in Cookery* [New York: Appleton, 1879], v).

¹⁶ See, for example, Charles Carter, *The Complete Practical Cook: or, a New System of the Whole Art and Mystery of Cooking* (London: Meadows, Rivington and Hett, 1730). The term continued into the nineteenth century with increasing popularity in books like A Lady [Maria Rundell], *A New System of Domestic Cookery formed upon Principles of Economy*, new ed. (London: John Murray, 1808).

¹⁷ Mrs Sarah Martin, *The New Experienced English-Housekeeper* (Doncaster: D. Boys, 1795), 1.

¹⁸ A Lady [Hannah Glasse], *The Art of Cookery, Made Plain and Easy* (London: Printed for the Author, 1747), 10.

¹⁹ Mrs [Hannah] Glasse, *The Art of Cookery, Made Plain and Easy*, new ed. (Dublin: W. Gilbert, 1799), 15-16.

²⁰ William Kitchiner, *The Cook's Oracle*, 2nd American ed. (Boston: Munroe and Francis, 1823), 33-34.

²¹ See Margaret R. Hunt, *The Middling Sort: Commerce, Gender, and the Family in England, 1680-1780* (Berkeley: University of California Press, 1996) and E.P. Thompson, "Time, Work-Discipline and Industrial Capitalism," in *Customs in Common*, 352-403 (London: The Merlin Press, 1991).

²² While prescribed measurements increase the repeatability, and thus the *precision*, of recipes, their inherent disapproval of adding a dab more flour or a splash more milk to perfect a food's texture may in fact make them less *accurate*. For the purposes of much of this chapter, however, the terms are used interchangeably. It is also worth noting that sometimes recipes were, in fact, given essentially in ratios, such as an early manuscript recipe for apricots: "Take 2 thirds of its' wayt in Sugar" (Lowther Family, *Collection of Cookery, Household, and Medical Receipts, Late 17th Century*, Wellcome MS 3341, in *Women and Medicine: Remedy Books, 1533-1865*, ed. Sara Pennell, reel 19 [London: Wellcome Institute for the History of Medicine, 2004], 119).

²³ Hon. Harriet Marsham, *Collection of Cookery Receipts, with a Few Medical Receipts. Mid 18th Century*, Wellcome MS 3460, in *Women and Medicine: Remedy Books, 1533-1865*, ed. Sara Pennell, reel 19 (London: Wellcome Institute for the History of Medicine, 2004), 12.

²⁴ Martin, 77.

²⁵ The ability to reckon a pound, however, the first (and basic ratio) value and for many early modern recipes, required an appraising eye, a mercantile skill apparently mastered by middle-class women and their servants. See Michael Baxandall, *Painting & Experience in Fifteenth-Century Italy* (Oxford: Oxford University Press, 1972), particularly pages 29-108 for information about the calculating eye of the Renaissance art viewer.

²⁶ A Lady [Rundell], xx.

²⁷ [William Kitchiner], *Apicius Redivivus; Or, the Cook's Oracle* (London: Samuel Bagster, 1817), n.p. ["Table of Weights and Measures," Preface 6].

²⁸ [Kitchiner], *Cook's Oracle* (1823), 12.

²⁹ Simon Schaffer, "Accurate Measurement Is an English Science," in *Values of Precision*, ed. M. Norton Wise (Princeton: Princeton University Press, 1995), 135.

³⁰ See Jan Golinski, "'The Nicety of Experiment': Precision of Measurement and Precision of Reasoning in Late Eighteenth-Century Chemistry," in *The Values of Precision*, ed. M. Norton Wise, 72-91 (Princeton: Princeton University Press, 1995) for some of the complications of measurement in chemistry. Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995) also argues that "The quest for precision has been sustained in science for reasons having more to do with moral economy than theoretical rigour. Precision has been valued as a sign of diligence, skill, and impersonality. Quantification has also been a crucial agency for

managing people and nature” (50). The morality element may have particular relevance in the home.

³¹ [Kitchiner], *Cook's Oracle* (1823), ix.

³² See, for example, David Gooding, Trevor Pinch, and Simon Schaffer, introduction to *The Uses of Experiment: Studies in the Natural Sciences* (Cambridge: Cambridge University Press, 1989), 3.

³³ [Kitchiner], *Apicius*, n.p. [“Stuffing for Hare” No. 379].

³⁴ Mrs Isabella Beeton, *The Book of Household Management*, facsimile 1st ed. (1861; London: Jonathan Cape, 1969), 40.

³⁵ [Kitchiner], *Apicius*, n.p. [Preface 6].

³⁶ Beeton, 40. Samuel and Sarah Adams, authors of *The Complete Servant* (London: Knight and Lacey, 1825), also recommended “graduated glass measures, such as the apothecaries use . . . in order to measure quantities of fluids with accuracy” (213). “Scales and weights,” they went on, “should also be kept at hand, not only for weighing heavy articles, such as butcher’s-meat, grocery, &c. but also such as will weigh small quantities with accuracy” (214). Another writer confirmed that “As one of the greatest elements of success in cooking is preciseness in the proportion of ingredients, the cook should never be without a good pair of scales, and she should keep them in thorough order” (Frederick Bishop, *The Illustrated London Cookery Book* [London: 227 Strand, 1852], xxii).

³⁷ Porter, 49. Leonore Davidoff and Catherine Hall’s *Family Fortunes: Men and Women of the English Middle Class 1780-1850*, rev. ed. (London: Routledge, 2002) also discusses the development of rationalized farming in the eighteenth and nineteenth centuries, involving clocks, thermometers, and barometers (256).

³⁸ William Kitchiner, *The Cook's Oracle* (New York: J & J Harper, 1830), n.p. [advertisement].

³⁹ Eliza Acton, *Modern Cookery in all its Branches*, 2nd ed. (London: Longman, Brown, Green and Longmans, 1845), x.

⁴⁰ See, for example, Acton, *Modern Cookery in all its Branches* (London), 35, 452; Kitchiner, *The Cook's Oracle*, new ed. (Edinburgh: Robert Cadell, 1845), 332.

⁴¹ By the 1870s, a textbook for labouring class girls also insisted that “Methodical habits are necessary to manage the food regularly and to ensure pleasant the taste of the household; a cook should never *guess* the time for cooking, or the quantities of ingredients or flavouring; if she does the food will never be two days alike” (Stoker, *Home Comfort: A Complete Manual of Domestic Economy* [London: W. Stewart & Co.?, 1876?], 239). Apparently the middle classes were imposing their values on those below them.

⁴² A Lady, *Murray's Modern Cookery Book*, iv.

⁴³ Kitchiner is one example.

⁴⁴ See, for instance, Thomas Webster and Mrs [Frances] Parkes, *An Encyclopædia of Domestic Economy* (London: Longman, Brown, Green, and Longmans, 1852).

⁴⁵ Matthey, 35.

⁴⁶ Matthey, 112. Straddling these two receipts are those that, while in paragraph form, begin with a quantity rather than an imperative verb.

⁴⁷ Webster and Parkes, 878; Kitchiner, *The Cook's Oracle* (1845), 82.

⁴⁸ Mrs Margaret Dods [Christian Isobel Johnstone], *The Cook and Housewife's Manual* (Edinburgh: Oliver and Boyd, 1828); and 8th ed. (Edinburgh: Oliver and Boyd, 1847), 570.

⁴⁹ There is also some evidence that the list form was more commonplace for contemporary apothecary receipts. Although Anthony Thomson's *The London Dispensatory* (e.g. 8th ed. [London: Longman, Rees, Orme, Brown, Green, & Longman, 1836]), an apothecary guide, preferred paragraphs to lists, the Matthey book includes remedies for coughs and bowel complaints in list form alongside paragraph cookery recipes; these appear to be from the early nineteenth century. If cookery was to be medically significant, it is logical that it should take on a more pharmaceutical form.

⁵⁰ Golinski observes this trend in chemistry: "Specialist expertise requires exclusive knowledge and discourse, intensive practical training, elaborate and expensive apparatus" (*Science*, 285). Although women were being excluded from high science, they practised the same specialist expertise and professionalization in their homes. Domestic receipts for dyeing were also undergoing similar changes toward systematization and formalization in this period (Beverly Lemire, personal communication).

⁵¹ William Nisbet, *A Practical Treatise on Diet* (London: R. Phillips, 1801), iv.

⁵² Ignotus [Dr Alexander Hunter], *Culina Famulatrix Medicinae* (York: Printed by T. Wilson and R. Spence, 1804), 7.

⁵³ Nisbet, 395.

⁵⁴ [Kitchiner], *Cook's Oracle* (1823), v.

⁵⁵ [Kitchiner], *Cook's Oracle* (1823), vii, vi.

⁵⁶ [Kitchiner], *Cook's Oracle* (1823), viii. Perhaps he was inspired by Ignotus, who suggested that "A Book of Cookery should, as nearly as possible, resemble a College Dispensatory" (8).

⁵⁷ M. Radcliffe, *A Modern System of Domestic Cookery* (Manchester: J. Gleave, 1823), 627.

⁵⁸ Of course, it should be noted that women did not readily relinquish their authority as family healers, and recipes for invalid food remained a cookbook staple. Beeton quoted Florence Nightingale as the expert on invalid feeding (893-94).

⁵⁹ e.g. William Cullen and Benjamin Smith Barton, *Professor Cullen's Treatise of the Materia Medica* (Philadelphia: Edward Parker, 1812), 1:21-22.

⁶⁰ William H. Brock, *Justus von Liebig: The Chemical Gatekeeper* (Cambridge: Cambridge University Press, 1997), 215-16. Jean-Louis Flandrin points out that there was an epicurean flourishing between about 1600 and 1800, when chemistry and physiology had advanced far enough to undermine the ancient Hippocratic dietetics, but not so far as to have any new dietetics to take its place ("From Dietetics to Gastronomy: The Liberation of the Gourmet," in *Food: A Culinary*

History from Antiquity to the Present, ed. Jean-Louis Flandrin and Massimo Montanari, trans. Clarissa Botsford et al. [New York: Columbia University Press, 1999], 430). This chemistry, however, ushered in the new dietetics.

⁶¹ *The Chemist* 2 (1824-25): 44, quoted in Golinski, *Science*, 263.

⁶² Myers, 53; Hazel Rossotti, “The Woman that Inspired Faraday,” *Chemistry World* (June 2007): 59.

⁶³ Rossotti, 60.

⁶⁴ Frederick Accum, *Chemical Amusement* (London: Thomas Boys, 1817). This democratic chemistry was probably, in large part, a myth. Chemistry was actually becoming more specialised in the first decades of the century, although many chemists remained committed to the communication of science to broader audiences (Golinski, *Science*, 199, 237). Women were also limited in their chemical endeavours. As Golinski notes, “It was a common view that women might attend chemical lectures and even perform a few simple experiments at home, but that the laboratory should remain a male preserve” (*Science*, 261). Jane Marcet’s students were to refrain from using chemical terms in daily conversation and would not study pharmacy, which was increasingly professional and male. But she encouraged them to understand that “every new fact, however unconnected it may at first appear with practical utility, must prove beneficial to mankind” ([Jane Marcet], *Conversations on Chemistry*, 5th ed. [London: Longman, Hurst, Rees, Orme, and Brown, 1817], 1:355).

⁶⁵ Frederick Accum, *Culinary Chemistry* (London: R. Ackermann, 1821), iii-iv.

⁶⁶ Accum, 3.

⁶⁷ “An Old Bohemian” [Gustave Strauss], *Dishes and Drinks; or, Philosophy in the Kitchen*, rev. ed. [London: Ward & Downey, 1887], 13-14.

⁶⁸ Quoted in A Lady, *Murray’s Modern Cookery Book*, 31.

⁶⁹ Review of *An Economical and New Method of Cookery*, by Eliza Melroe, *The Monthly Review; or Literary Journal, Enlarged* 25 (1798): 353; Eliza Melroe, *An Economical, and New Method of Cookery* (London: Printed for the Author, 1798), 6.

⁷⁰ Review of *Domestic Management*, by a Lady, *The British Critic* 37 (1811): 313.

⁷¹ James Boswell, *The Life of Samuel Johnson, LL.D.* (London: J. Davis, 1817), 637; B.P., “Remarks on Cookery,” review of *Le Cuisinier Imperial, The London and Country Cook, Cookery and Pastry, A Complete System of Cookery, and Domestic Cookery*, *Blackwood’s Edinburgh Magazine* 2 (1817-18): 304.

⁷² In 1857 Charles Pierce’s *The Household Manager* insisted that a good cook be “familiarized with culinary chemistry, and with the medical properties of the viands at his command” ([London: George Routledge & Co., 1857], 274). He could also still quote an 1810 writer who stated that “the stomach is the chief organ of the human system; and upon its state the powers and feelings of each individual mainly depend” (24, quoting *The New Family Receipt-Book* [London: John Murray, 1810], 13).

⁷³ Pierce, 16.

⁷⁴ A Lady, *Murray's Modern Cookery Book*, 38; Edward L. Youmans, *The Hand-Book of Household Science* (New York: Appleton, 1858). This book was probably read in Britain, too, given its presence in the British Library and Youmans's known correspondence with British scientists and thinkers.

⁷⁵ Although Brock suggests that this title was not conferred until 1855 (*Justus von Liebig*, 219), it is evident in advertising as early as 1851. See, for instance, Longman, Brown, Green, Longmans, and Roberts, "Alphabetical Catalogue of New Works and New Editions," in Sir John F.W. Herschel, *Outlines of Astronomy*, 4th ed. (London: Longman, Brown, Green, and Longmans, 1851), 1.

⁷⁶ As Brock points out, for example, Liebig was incorrect in thinking that seared roasts preserve their juices better. He argues that this is an example of Liebig's "undermining of tacit knowledge" through his so-called scientific theories (*Justus von Liebig*, 219). Liebig's own recipes are an intriguing combination of cookery and pharmaceutical terms. One reproduced in the *Englishwoman's Domestic Magazine* reads, "Take half-a-pound of newly-killed beef or fowl, chop it fine, add 11/8lb. of distilled water, with four drops of pure muriatic acid, and 34 to 67 grains of common salt, and stir well together" ("Earth, Air, Fire, and Water;" or, Domestic Science from an Old Text," *Englishwoman's Domestic Magazine* 41 [May 1868]: 252).

⁷⁷ Eliza Acton, *Modern Cookery for Private Families*, rev. and enlarged (London: Longman, Green, Longman, Roberts, and Green, 1864), viii, title page.

⁷⁸ William Gregory, ed., *Researches on the Chemistry of Food*, by Justus von Liebig (London: Taylor and Walton, 1847), 124n.

⁷⁹ Acton, *Modern Cookery for Private Families*, 171, 168. She mentions chemist Jonathan Pereira, for example, only briefly (310 and 600).

⁸⁰ Acton, *Modern Cookery for Private Families*, 7.

⁸¹ Gregory, ed., 124n; Acton, *Modern Cookery for Private Families*, 309.

⁸² *London Medical Gazette*, quoted in advertisement in Eliza Acton, *Modern Cookery in all its Branches*, American ed. prepared by Mrs S.J. Hale (Philadelphia: Lea and Blanchard, 1845); Review of *Modern Cookery in all its Branches Reduced to a System of Easy Practice, &c.*, by Eliza Acton, *Medico-Chirurgical Review*, n.s. 1, no. 2 (April 1845): 560; Review of *Modern Cookery in all its Branches*, by Eliza Acton, *Pharmaceutical Journal and Transactions* 4 (1844-45): 385.

⁸³ Longman, Brown, Green and Longmans, Classified Index, in *Medico-Chirurgical Transactions* 31 (1848), [523].

⁸⁴ Acton, *Modern Cookery in all its Branches* (London), xix-xx.

⁸⁵ A Lady, *Murray's Modern Cookery Book*, 29.

⁸⁶ Miss [Catharine] Beecher, *Domestic Receipt Book* (New York: Harper & Brothers, 1846), 1.

⁸⁷ Beecher, 3, 4-5, 10.

⁸⁸ Stoker, 132.

⁸⁹ Mrs Henry [Christine] Reeve, *Cookery and Housekeeping* (London: Longmans, Green, and Co., 1882), 71.

- ⁹⁰ [William Wills and Eliza Lynn], “Common Cookery,” *Household Words* (26 January 1856): 46.
- ⁹¹ “My Mother’s Note-Book,” *The Servant’s Magazine* 7 (1844): 12.
- ⁹² “An Estimation of the Loss of Weight which Takes Place in Cooking Animal Food,” *The Philosophical Magazine: Comprehending the Various Branches of Science, the Liberal and Fine Arts, Geology, Agriculture, Manufactures and Commerce* 36 (1810): 142-43. For Kitchiner, see, for example, *The Cook’s Oracle* (1823), 73. American reprints include “Loss of Weight in Cooking Animal Food,” in *The Winter Evening Book*, [ed. William Chambers and Robert Chambers], 302-3 (New York: Charles S. Francis, and Boston: Joseph H. Francis, 1837); and “Loss of Weight in Cooking Animal Food,” *The People’s Magazine* 1 (1834): 119.
- ⁹³ Pierce, 57.
- ⁹⁴ Pierce, 60.
- ⁹⁵ William Kitchiner, *The Cook’s Oracle* (1845), 81.
- ⁹⁶ “‘Earth, Air, Fire, and Water,’ or, Domestic Science from an Old Text,” *Englishwoman’s Domestic Magazine* 40 (April 1868): 195.
- ⁹⁷ Mrs Loudon, *The Lady’s Country Companion; or, How to Enjoy Country Life Rationally*, 4th ed. (London: Longman, Brown, Green, and Longmans, 1852), 55-56. These tests might include examinations of the colour of the oven bricks, throwing a stale breadcrumb or scrap of paper into the oven, the sparking of embers on the floor, or placing one’s hand inside the oven.
- ⁹⁸ A Lady, *Murray’s Modern Cookery Book*, 505. The saccharometer was a relatively recent invention, first manufactured in the 1790s but probably too expensive for household use until well into the next century. See A.D. Morrison-Low, “Hydrometer,” in *Instruments of Science: An Historical Encyclopedia*, ed. Robert Bud and Deborah Jean Warner, 311-13 (London: The Science Museum, and Washington: The National Museum of American History, Smithsonian Institution, 1998).
- ⁹⁹ A Lady, *Murray’s Modern Cookery Book*, iii-iv, title page.
- ¹⁰⁰ Andrea Broomfield, “Rushing Dinner to the Table: The *Englishwoman’s Domestic Magazine* and Industrialization’s Effects on Middle-Class Food and Cooking, 1852-1860,” *Victorian Periodicals Review* 41, no. 2 (2008): 121n35.
- ¹⁰¹ Broomfield; [Kitchiner], *The Cook’s Oracle* (1823), 187, 284, 97, 308.
- ¹⁰² Exceptions include A.F.M. Willich, *The Domestic Encyclopaedia*, 1st American ed. (Philadelphia: William Young Birch and Abraham Small, 1803), but explicit references to chemicals are relatively unusual in early cookery books.
- ¹⁰³ Pierce, 52, quoting M.M. [Mary Ellen Meredith], “Gastronomy and Civilization,” *Fraser’s Magazine* 44 (1851): 607.
- ¹⁰⁴ Melanie Keene, “Domestic Science: Making Chemistry Your Cup of Tea,” *Endeavour* 32, no. 1 (2008): 16.
- ¹⁰⁵ John Farley, *London Art of Cookery*, 4th ed. (London: J. Scatcherd and J. Whitaker, 1787), 417.

¹⁰⁶ Mrs Charlotte Mason, *The Ladies' Assistant for Regulating and Supplying the Table*, 6th ed. (London: J. Walter, 1787), 478-79. Mason's and Farley's books appear to overlap significantly. More research will examine the relationship between the two works; they may be interpreted as men's and women's versions of the same text.

¹⁰⁷ Frederick Accum, *A Treatise on Adulterations of Food and Culinary Poisons*, 2nd ed. (London: Longman, Hurst, Rees, Orme, and Brown, 1820), iii, vi.

¹⁰⁸ Detecting alum in bread, for instance, required adding distilled water and filtering. "Evaporate the fluid to about one fourth of its original bulk," Accum went on, "and let gradually fall into the clear fluid a solution of muriate of barites. If a *copious* white precipitate ensue, which does not disappear by the addition of *pure* nitric acid, the presence of alum may be suspected" (*Treatise*, 139). A section on checking water purity in *Deane's Illustrated Almanack* was slightly more hybrid, advising adding sulphuretted hydrogen to water in a "porcelain cup upon the tea-urn" ([London: Deane and Company, 1863], 52, Museum of London 96.89). Many of these chemicals were apparently available to women without much difficulty. An article in the *Englishwoman's Domestic Magazine*, for instance, observed that permanganate of soda was sold in shops as "Condy's Disinfecting Fluid" ("Earth, Air, Fire, and Water;" or, Domestic Science from an Old Text," *Englishwoman's Domestic Magazine* 39 [March 1868]: 130).

¹⁰⁹ Berris Charnley, "Arguing over Adulteration: The Success of the Analytical Sanitary Commission," *Endeavour* 32, no. 4 (2008): 129-33.

¹¹⁰ [John Wilson], Review of *A Treatise on the Adulteration of Food*, by Frederick Accum, *Blackwood's Edinburgh Magazine* 6 (1820): 543.

¹¹¹ E.g. [John Wilson], Review of *A Treatise on the Adulteration of Food*, by Frederick Accum, *The Analectic Magazine*, n.s. 2 (1820): 102-129; and Professor [John] Wilson, "There is Death in the Pot," in *The Works of Professor Wilson of the University of Edinburgh*, ed. Professor Ferrier, 5:75-93 (Edinburgh: Blackwood and Sons, 1856).

¹¹² C. Anne Wilson, "Introduction: Meal Patterns and Food Supply in Victorian Britain," *Eating with the Victorians*, ed. C. Anne Wilson, paperback ed. (Stroud, Gloucestershire: Sutton Publishing, 2004), xv-xvi.

¹¹³ See, for example, Radcliffe, 289; Hartelaw Reid, *Cookery, Rational, Practical, and Economical*, 2nd ed. (London: Houlston & Stoneman, 1855), 163; and Bishop, 13-14.

¹¹⁴ "Earth, Air, Fire, and Water;" or, Domestic Science from an Old Text," *Englishwoman's Domestic Magazine* 41 (May 1868): 250; "Earth, Air, Fire, and Water;" or, Domestic Science from an Old Text," *Englishwoman's Domestic Magazine* 39 (March 1868): 130.

¹¹⁵ [R.K. Philp, ed.], *Enquire Within upon Everything* (London: Houlston and Stoneman, 1856), 278.

¹¹⁶ Eliza Acton, *The English Bread-Book for Domestic Use* (London: Longman, Brown, Green, Longmans, & Roberts, 1857), 81. See also "Our Daily Bread," *The What Not; or Ladies' Handy-Book* 4 (1863): 49.

¹¹⁷ Farley, 410.

¹¹⁸ A Lady, *Murray's Modern Cookery Book*, 70.

¹¹⁹ Golinski has used the expression to explain a movement away from sensory discrimination in chemistry (*Science*, 277).

¹²⁰ Reeve, 269.

¹²¹ Beeton, 186, 217, 350, 999; *Oxford English Dictionary* s.v. "gill," n³. I am indebted to Beverly Lemire for this observation.

¹²² B.P., 301.

¹²³ Beeton, 26. Although this chapter has focused particularly on chemistry and dietetics, other branches of science were making their way into cookery, as well. Beeton also included, "on the best authority [she] could obtain, ... an account of the natural history of the animals and vegetables which we use as food" (iv). Her chapter on fish, for instance, began with a biological description: "In Natural History, fishes form the fourth class in the system of Linnæus" (105). The classification projects of the eighteenth and nineteenth centuries continued into cookery.

¹²⁴ A Lady, *Murray's Modern Cookery Book*, 28.

¹²⁵ Count Rumford [Benjamin Thompson], *The Complete Works of Count Rumford* (London: MacMillan and Co. 1876), 4:333-34: "When the *science* of cookery is once well understood, or an intimate knowledge is acquired of the precise nature of those chemical and mechanical changes which are produced in the various culinary processes, we may then, and not till then, take measures with certainty for improving the *art* of preparing food. Experience, unassisted by science, may lead, and frequently does lead, to useful improvements; but the progress of such improvement is not only slow, but vacillating, uncertain, and very unsatisfactory. On that account, no doubt, it is that men of science have in all ages been respected as valuable members of society." Golinski, *Science*, 241.

¹²⁶ Acton, *Modern Cookery for Private Families*, viii.

¹²⁷ Review, *Medico-Chirurgical Review*, 560.

Chapter 2: Material Changes in the Home

¹ Count Rumford [Benjamin Thompson], *The Complete Works of Count Rumford*. (London: MacMillan and Co, 1876), 5:745.

² [R.K. Philp], *The Housewife's Reason Why* (London: [Houlston and Wright?], [1859]), iii.

³ Theresa M. McBride, *The Domestic Revolution: The Modernisation of Household Service in England and France 1820-1920* (New York: Holmes & Meier, 1976), 117. Elsewhere, however, McBride notes "attempts to rationalize domestic life in the same way that rational principles were being introduced into commercial and professional life," suggesting that at least some social technologies were in place (21). Although Siegfried Giedion acknowledges that the nineteenth century was an important time for mechanization, he argues that this process's full possession of the domestic sphere was not until around 1920

(*Mechanization Takes Command: A Contribution to Anonymous History* [New York: Oxford University Press, 1948], 41-42).

⁴ Melanie Keene, "Domestic Science: Making Chemistry Your Cup of Tea," *Endeavour* 32, no. 1 (2008): 17; Henry Mayhew, *The Wonders of Science; or, Young Humphry Davy* (London: David Bogue, 1855), 68.

⁵ Mrs [Florence] Caddy, *Household Organization* (London: Chapman and Hall, 1877), 35.

⁶ Thomas P. Hughes, "The Evolutions of Large Technological Systems," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, ed. T.J. Pinch, Wiebe E. Bijker, and Thomas Parke (Cambridge, MA: MIT Press, 1987), 51.

⁷ Hughes, 52.

⁸ Discerning the contents of a nineteenth-century kitchen is challenging, especially since household inventories and auction lists often reduce them to, as in the case of an 1814 auction of dry goods near Shrewsbury, "the general routine of Kitchen Furniture and Culinary Vessels &c." (Jonathan Perry, auction advertisement, *Salopian Journal* [11 May 1814], quoted in Margaret Posenby, *Stories from Home: English Domestic Interiors, 1750-1850* [Aldershot: Ashgate, 2007], 88.) What was "the general routine" to the advertising auctioneer is more opaque to the historian. However, advertisements and exhibitions provide some information about what was available for purchase. What constituted new technology is, of course, relative. Mistresses often complained about "cottage girls" being overwhelmed by the middle-class home. *The Edinburgh Review* described the "bewilderment of any raw girl amidst the furniture and the methods of a middle-class house. She has to learn the use of a hundred things she never saw before, and to take care of articles which seem made only to be broken" ("Modern Domestic Service," *Edinburgh Review* 115 [April 1862]: 18). Peelers and ranges might be new to them. This chapter, however, focuses especially on what was novel for the middle classes.

⁹ Christina Hardyment, *From Mangle to Microwave: The Mechanization of Household Work* (Cambridge: Polity Press, 1988), 158.

¹⁰ See "An Old Bohemian" [Gustave Strauss], *Dishes and Drinks; or, Philosophy in the Kitchen*, rev. ed. [London: Ward & Downey, 1887], 30; Elizabeth Burton, *The Early Victorians at Home, 1837-1861* (London: Longman, 1972), 107; and "Things Worth Knowing," *Englishwoman's Domestic Magazine* (June 1852): 53.

¹¹ "Kent's Knife Cleaning Machine," Advertiser for *Official Descriptive and Illustrated Catalogue of the Great Exhibition of the Works of Industry of all Nations* (London: Royal Commission, 1851), 1:69.

¹² Spong & Co., *Manufacturers of Domestic Machinery Trade Catalogue* (1883?), Museum of London Ephemera Collections.

¹³ *Deane's Illustrated Almanack* (London: Deane and Company, 1863), 145, Museum of London 96.89.

¹⁴ A[lexis] Soyer, *The Gastronomic Regenerator*, 6th ed. (London: Simpkin, Marshall, & Co., 1849), xi, 613-634.

- ¹⁵ “Evans’s Matchless Kitchener,” *The Lady’s Newspaper and Pictorial Times* 812 (19 July 1862): 47.
- ¹⁶ *Official Catalogue*, 474, 200.
- ¹⁷ *Official Catalogue*, 326, 640.
- ¹⁸ Percival Gordon Smith and Keith Downes Young, “Architecture,” in *Our Homes and How to Make them Healthy*, ed. Shirley Forster Murray (London: Cassell and Company, 1883), 152.
- ¹⁹ Andrew Ure, *The Philosophy of Manufactures* (London: Charles Knight, 1835), 1-2.
- ²⁰ Ure, 20.
- ²¹ Caroline Davidson, *A Woman’s Work is Never Done: A History of Housework in the British Isles 1650-1950* (London: Chatto and Windus, 1982), 60.
- ²² J.D. Bernal, *Science and Industry in the Nineteenth Century* (1953; Bloomington: Indiana University Press, 1970), 21.
- ²³ “Specification of Thomas Robinson: Kitchen Range,” Great Britain Patents 6:1, no. 1267 (London: Great Seal Patent Office, 1855), 2, Wellcome Library, London.
- ²⁴ Thomas Robinson, “Patent Ranges and Ovens upon an Entire New Construction” (London: 1780), depicted in Davidson, 58.
- ²⁵ Davidson, 59.
- ²⁶ Rumford, 5:777. See also “The use of science is so to explain the operations which take place in the practice of the arts, and to discover the means of improving them; and there is no process, however simple it may appear to be, that does not afford an ample field for curious and interesting investigation” (5:617).
- ²⁷ Rumford, 4:206.
- ²⁸ Rumford, 5:777; 5:755-56.
- ²⁹ Rumford, 4:348.
- ³⁰ Rumford, 4:198. The term “machinery” was apparently used somewhat loosely in the eighteenth and nineteenth centuries, with meanings centred more on the idea of efficiency and co-operation than precise moving parts.
- ³¹ Rumford, 4:201.
- ³² Isabella Beeton called him “the celebrated philosopher and physician, who wrote so learnedly on all subjects connected with domestic economy and architecture” (*The Book of Household Management*, facsimile 1st ed. [1861; London: Jonathan Cape, 1969], 25).
- ³³ Alison Ravetz, “The Victorian Coal Kitchen and its Reformers,” *Victorian Studies* 11, no. 4 (1968): 439; Asa Briggs, *Victorian Things* (Chicago: University of Chicago Press, 1988), 241.
- ³⁴ Rev. J. Goldsmith, *A Geographical View of the World, Embracing the Manners, Customs, and Pursuits of Every Nation*, 1st American ed., ed. James G. Percival (New York: E. Hopkins and W. Reed, 1826), 169-70.
- ³⁵ Rumford, 4:233-34; 4:198-99.
- ³⁶ Thomas Webster and Mrs [Frances] Parkes, *An Encyclopædia of Domestic Economy* (London: Longman, Brown, Green, and Longmans, 1852), in fact, quoted Rumford’s comments about stubborn cooks in their discussion of efficient

kitchen organization (805-6), but they continued to assume the use of more traditional range styles. Efficiency was instead addressed in other ways. An 1847 range had standardized parts that could be combined in various ways to fulfil the specifications and requirements of the user, and the advertisement claimed to prevent the inconvenience of reaching over the fire or stooping to use the oven (The Mastodon Air-Tight Cooking Range [Boston, 1847], reproduced in Giedion, 612).

³⁷ Ravetz, 444.

³⁸ Jane Welsh Carlyle to Thomas Carlyle, 12 October 1835, in *The Carlyle Letters Online*.

³⁹ Mrs J.E. Panton, *From Kitchen to Garret: Hints for Young Householders*, 5th ed. (London: Warne and Downey, 1888), 13.

⁴⁰ While one Birmingham iron master's daughter designed a fireplace, it was never widely produced (Leonore Davidoff and Catherine Hall, *Family Fortunes: Men and Women of the English Middle Class 1780-1850*, rev. ed. [1987; London: Routledge, 2002], 312).

⁴¹ Catharine E. Beecher and Harriet Beecher Stowe, *The American Woman's Home, or, Principles of Domestic Science; being a Guide to the Formation and Maintenance of Economical, Healthful, Beautiful and Christian Homes* (New York: J.B. Ford, 1869), 67. Although the Beechers were American, their work was probably read in England. Copies of this text sit at the British Library and the University of Oxford. Magazine articles similarly explained the science behind gas lights, barometers, and kitchen pumps, as though this education would help women use their equipment more efficiently, or perhaps simply satisfy some curiosity. See "Earth, Air, Fire, and Water"; or Domestic Science from an Old Text," *Englishwoman's Domestic Magazine* 45 (September 1868): 139-40.

⁴² John Charles Buckmaster, *Buckmaster's Cookery: Being an Abridgment of Some of the Lectures Delivered in the Cookery School at the International Exhibition for 1873 and 1874* (London: Routledge, 1874), 19, quoted in Andrea Broomfield, *Food and Cooking in Victorian England: A History* (Westport, CT: Praeger, 2007), 111.

⁴³ "Patent American Kitchener," *The Lady's Newspaper and Pictorial Times* 771 (5 October 1861): 223.

⁴⁴ Briggs, 23-24.

⁴⁵ Quoted in "At the Great Exhibition in 1851," placard in "Making the Modern World" Gallery (Science Museum London, 2009).

⁴⁶ Hardymont, 122

⁴⁷ Alexis Soyer, *The Modern Housewife or Ménagère* (1849; London: Simpkin, Marshall, & Co., 1851), between pages 410 and 411, 411.

⁴⁸ Sarah Freeman, *Mutton and Oysters: The Victorians and their Food* (London: Victor Gollancz, 1989), 118; Beecher and Stowe, 432, 118.

⁴⁹ Webster and Parkes, 836.

⁵⁰ Wolfgang Schivelbusch, *Disenchanted Night: The Industrialization of Light in the Nineteenth Century*, trans. Angela Davies (Berkeley: University of California Press, 1988), 40.

⁵¹ Herbert Sussman, *Victorian Technology: Invention, Innovation, and the Rise of the Machine* (Santa Barbara, CA: Praeger, 2009), 30.

⁵² Schivelbusch, 31.

⁵³ Lynda Nead, *Victorian Babylon: People, Streets and Images in Nineteenth-Century London* (New Haven, Yale University Press, 2000), 34.

⁵⁴ Dr C.G. Carus, *The King of Saxony's Journey through England and Scotland in the Year 1844*, trans. by S.C. Davison (London: Chapman and Hall, 1846), 95; also quoted, with a different translation, in Schivelbusch, 33-34.

⁵⁵ Jenni Calder, *The Victorian Home* (London: B.T. Batsford, 1977), 91.

⁵⁶ Schivelbusch, 28. This argument is extreme, since urban households had long been connected to other economic entities, and many were equipped with drains, for example. Gas, however, did represent a new industrial link.

⁵⁷ Schivelbusch, 38, quoting Frederick Accum, *Description of the Process of Manufacturing Coal Gas for the Lighting of Streets, Houses, and Public Buildings* (London: Thomas Boys, 1819), 10. The same advice was repeated in "Earth, Air, Fire, and Water"; or Domestic Science from an Old Text," 140. Readers were also reminded to see that any gas leaks were repaired with solder, not white-lead.

⁵⁸ *Hackney and Kingsland Gazette* (22 July 1874), quoted in Sarah Milan, "Refracting the Gaselier: Understanding Victorian Responses to Domestic Gas Lighting," in *Domestic Space: Reading the Nineteenth-Century Interior*, ed. Inga Bryden and Janet Floyd (Manchester: Manchester University Press, 1999), 90; Schivelbusch, 157-58.

⁵⁹ Milan, 84, 89; Mrs [Lucy] Orrinsmith, *The Drawing-Room: Its Decorations and Furniture* (London: MacMillan and Co., 1878), 117; also quoted in Milan, 98.

⁶⁰ Dora Hope, "Margaret Trent, and How She Kept House," *The Girl's Own Paper* 102 (10 December 1881): 169. See also J.O.N. Rutter: "For a long period after the manufacture of gas had been introduced into all the principal towns in the kingdom, it was considered as applicable only to the lighting of streets, shops, warehouses, factories, and public buildings. Its employment in the entrance-hall or stair-case of a well-furnished house was deemed a bold experiment; and when it advanced still further into the interior, and occupied the passages and domestic offices, many old-fashioned people shook their heads, looked grave, and predicted terrible consequences. These fears and forebodings have passed away; or, if in some dark corner a few of them still exist, along with a horror of rail-roads, steam-boats, and electric telegraphs, they are exceptions to the feelings of confidence and satisfaction which so generally prevail wherever gas-light has had a fair trial" ([1845], quoted in Schivelbusch, 158).

⁶¹ J.O.N. Rutter acknowledged that those for less conspicuous parts of the house could be simple (*Advantages of Gas in Private Houses* [Cambridge, MA: Thurston and Torry, 1855], 12).

- ⁶² High sulphur content enabled gas companies to produce more profitable by-products (Milan, 90-91). See also Hardyment, 25.
- ⁶³ Milan, 91; Edward L. Youmans, *The Hand-Book of Household Science. A Popular Account of Heat, Light, Air, Aliment, and Cleansing, in their Scientific Principles and Domestic Applications* (New York: Appleton, 1858), 201-2; Rutter, *Advantages*, 26-27.
- ⁶⁴ Webster and Parkes, 168.
- ⁶⁵ Rutter, *Advantages*, 29. This is an American version of an originally British book.
- ⁶⁶ Rutter, *Advantages*, 4.
- ⁶⁷ Milan, 87.
- ⁶⁸ Charles Babbage, *On the Economy of Machinery and Manufactures* (London: Knight, 1832), 56-57.
- ⁶⁹ Rutter, *Advantages*, 18.
- ⁷⁰ William Matthews, *Hydraulia; An Historical and Descriptive Account of the Water Works of London* (London: Simpkin, Marshall, and Co., 1835), 57, 2.
- ⁷¹ Matthews, 214.
- ⁷² Stefan Muthesius, *The English Terraced House* (New Haven: Yale University Press, 1982), 56.
- ⁷³ Jane Welsh Carlyle to Jeannie Welsh, 1 April 1844, in *The Carlyle Letters Online*.
- ⁷⁴ Jane Welsh Carlyle to Thomas Carlyle, 12 February 1855, in *The Carlyle Letters Online*.
- ⁷⁵ H.J. Dyos, *Victorian Suburb: A Study of the Growth of Camberwell* (Leicester: Leicester University Press, 1961), 144.
- ⁷⁶ Burton, 106.
- ⁷⁷ Household management guides advised that cistern water be drawn off at least once a fortnight, and the whole thing cleaned at least three times a year; filters were to be washed out once a week (Cre-fydd, *The Young Housewife's Daily Assistant* [London: Simpkin, Marshall, and Co., 1864], 318).
- ⁷⁸ Thea Holme, *The Carlyles at Home* [London: Oxford University Press, 1965], 11, 49.
- ⁷⁹ Dyos, 143.
- ⁸⁰ Thomas Carlyle to Margaret A. Carlyle, 15 November 1852, in *The Carlyle Letters Online*.
- ⁸¹ See Annmarie Adams, *Architecture in the Family Way: Doctors, Houses, and Women, 1870-1900* (Montreal and Kingston: McGill-Queen's University Press, 1996) for an excellent discussion of women and plumbing in the late nineteenth century.
- ⁸² Muthesius, 62.
- ⁸³ Samuel B. Goslin, *A Review of the Facts and Records in Connection with Kitchen Boiler Explosions and Hot-Water Boiler Explosions, of 1881* (London: Warner and Sons and McCorquodale, 1881), 6, 9.
- ⁸⁴ *Official Catalogue*, 597.

⁸⁵ Muthesius, 54.

⁸⁶ Babbage, 9.

⁸⁷ Webster and Parkes, 848. An M.S.A. and M.R.A.S., *The Grammar of House-Planning* (Edinburgh: A. Fullerton & Co., 1864) also pointed out the importance of speaking tubes, since they saved the servant a long trip simply to find out what was wanted of her (40).

⁸⁸ Webster and Parkes, 58.

⁸⁹ See, for example, Charles Pierce, *The Household Manager: Being a Practical Treatise upon the Various Duties in Large or Small Establishments, from the Drawing-Room to the Kitchen* (London: Routledge, 1857): “[The master or mistress] must be able, on any emergency, to refer separately to each department, to the particular range of duty of each of their servants, as well as to the appliances they positively require in order to discharge them properly” (6); Jane Carlyle to Thomas Carlyle: “The economical department is in a very backward state, but not confused, for it is as clear as day that not a single bill has been paid since I left” (15 September 1845, in *The Carlyle Letters Online*); and Babbage, *passim*.

⁹⁰ Robert Kerr, *The Gentleman’s House; or, How to Plan English Residences, from the Parsonage to the Palace* (London: John Murray, 1865), 198.

⁹¹ Posonby, 13.

⁹² Indeed, even the differentiation of living and work spaces was elusive in the crowded middle-class home. Many servants slept and groomed in the kitchen, and kept their things there. Some authors saw this ambiguity as problematic: “I have in some establishments,” moaned Strauss, “seen the dresser drawers encumbered with miscellaneous collections of articles that certainly had no business there, even to the cook’s comb and brush, cold cream and puff box, with an elegant assortment, occasionally, of dirty socks and stockings and pocket handkerchiefs, dish cloths, and other abominations” (An Old Bohemian, 14-15). Any attempt to change this would probably be futile.

⁹³ Kerr, 200, 71. But for all this scientific planning, women’s expertise was acknowledged as crucial. The *Building News* even recommended that architects consult their wives on domestic plans, since they “can detect at a glance all the shortcomings of which he may have been guilty in the non-production of a good and useful culinary laboratory” (quoted in an M.S.A. and M.R.A.S., 40). However, the writer made it clear that it was not necessary for “married members of the profession to be always at their wives aprons,” simply that the “sensible and good housewife” could see “those ‘little things’ which go to make up the comfort and convenience of this truly domestic portion of an Englishman’s castle” (39).

⁹⁴ Sidney Pollard, *The Genesis of Modern Management: A Study of the Industrial Revolution in Great Britain* (London: Edward Arnold, 1965), 263.

⁹⁵ James Montgomery, extract from *On the Theory and Practice of Cotton Spinning* (Glasgow, 1836), in *Technology and Toil in Nineteenth Century Britain*, ed. Maxine Berg (London: CSE Books, 1979), 59; George S. White, *Memoir of Samuel Slater* (Philadelphia, 1836), 306, quoted in Pollard, 263.

- ⁹⁶ Pollard, 262.
- ⁹⁷ Erich Roll, *An Early Experiment in Industrial Organization: Being a History of the Firm of Boulton and Watt, 1775-1805* (London: Longmans, Green and Co., 1930), 175.
- ⁹⁸ Elizabeth L. Banks, *Campaigns of Curiosity: Journalistic Adventures of an American Girl in Late Victorian London*, facsimile ed. of *Campaigns of Curiosity: Journalistic Adventures of an American Girl in London* (1894; Madison: University of Wisconsin Press, 2003), 7.
- ⁹⁹ Banks, 34, 86-87.
- ¹⁰⁰ Banks, 35, 60-61.
- ¹⁰¹ Banks, 91; Webster and Parkes, 18.
- ¹⁰² Banks, 91.
- ¹⁰³ "The Englishwoman's Conversazione," *Englishwoman's Domestic Magazine* 83 (November 1871): 318, 319; also reproduced in J.A. Banks, *Prosperity and Parenthood: A Study of Family Planning among the Victorian Middle Classes* (London: Routledge and Kegan Paul, 1954), 211-216.
- ¹⁰⁴ Dora Hope, "Margaret Trent, and How She Kept House," *The Girl's Own Paper* 115 (11 March 1882): 371.
- ¹⁰⁵ Caddy, ix.
- ¹⁰⁶ Caddy, 54, 109, 122.
- ¹⁰⁷ Caddy, 29-30.
- ¹⁰⁸ See, for instance, Edward Baines, preface to *History of the Cotton Manufacture in Great Britain* (London: H. Fisher, R. Fisher, and P. Jackson, 1835), 5-9.
- ¹⁰⁹ E.L.L. [Eliza Lynn Linton], "On the Side of Maids," *The Cornhill Magazine* 29 (1874): 306-7.
- ¹¹⁰ "The Washing Misery," *The What Not; or Ladies' Handy-Book 5?* (1864?): 13-14; Benjamin Ward Richardson, *Hygeia: A City of Health* (London: MacMillan, 1876), 24-26.
- ¹¹¹ "Domestic Economy," *The Englishwoman's Review* 52 (15 August 1877): 348.
- ¹¹² "Domestic Economy," 349.
- ¹¹³ "Domestic Economy," 355. It is fitting, too, that women's first taste of suffrage and political office was in local government, which dealt with such issues.
- ¹¹⁴ Youmans, xiv.
- ¹¹⁵ Beecher and Stowe, 175; Caddy, 82-83.
- ¹¹⁶ Beeton, 114.
- ¹¹⁷ Mistress Margaret Dods [Christian Isobel Johnstone], *The Cook and Housewife's Manual: A Practical System of Modern Domestic Cookery and Family Management*, 11th ed. (Edinburgh: Oliver and Boyd, 1862), 108-9.
- ¹¹⁸ Hermann Muthesius, *The English House*, ed. Dennis Sharp and trans. Janet Seligman (1904; New York: Rizzoli, 1979), 155.
- ¹¹⁹ Youmans, xiv-xv. It is also worth noting that the nineteenth century, or perhaps earlier (the *Oxford English Dictionary's* first cited use is, unhelpfully, 1938), saw the coining of the expression "household science." "There are many

things about them [the general laws of light, heat, and air] which a person, as a resident of a house, cares little to know; while there are others in which he has a profound interest. To consider these, we assume to be the province of *household science*" (Youmans, vii).

¹²⁰ Rutter, 15.

¹²¹ Ruth Schwarz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983).

¹²² "The Sewing Machine," *Englishwoman's Domestic Magazine* 35 (November 1867): 586.

¹²³ John Taylor, ed., *Illustrated Guide to Sheffield and the Surrounding District* (Sheffield: Pawson and Brailsford, 1879), 284; Stefan Muthesius, 17.

¹²⁴ Holme, 10.

¹²⁵ Frederic S. Cozzens, *The Sparrowgrass Papers: Living in the Country* (New York: Derby & Jackson, 1856), 215. The mechanical bed may have been inspired by a specially designed servants' bedstead displayed at the Great Exhibition. It incorporated a clockwork device that, "at the appointed hour, withdrew a support from the foot of the bed so that it collapsed and threw the occupant onto the floor" (Frank E. Huggett, *Life Below Stairs: Domestic Servants in England from Victorian Times* [London: John Murray, 1977], 73). It is significant that a mechanical appliance for servants was inappropriate for the master and his wife.

¹²⁶ Cozzens, 217.

¹²⁷ Cozzens, 223.

¹²⁸ Charles Dickens, *Hard Times for these Times* (London: Bradbury and Evans, 1854), 12.

¹²⁹ Dickens, 13.

¹³⁰ Dickens, 4.

¹³¹ In 1829 Thomas Carlyle referred to the "Age of Machinery," complaining that "not the external and physical alone is now managed by machinery, but the internal and spiritual also" ("Signs of the Times," *The Edinburgh Review* 49 [1829]: 442).

¹³² Mrs A.G.F. Eliot James, *Our Servants: Their Duties to Us and Ours to Them* (London: Ward, Locke and Co., [1883]), 32; Beeton, 42.

¹³³ Moira Donald, "Tranquil Havens? Critiquing the Idea of Home as the Middle-Class Sanctuary," in *Domestic Space: Reading the Nineteenth-Century Interior*, ed. Inga Bryden and Janet Floyd (Manchester: Manchester UP, 1999), 117.

¹³⁴ George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980), 155. In fact, the machinery metaphor was common in other nineteenth-century settings, too. As S.S. Schweber notes, "The same time span saw the adoption of similar models and metaphors of self-regulating mechanism in the sciences. O. Mayr has emphasized the importance of the steam engine in the development of Adam Smith's concept of society as a self-regulating system. In the 1830s, [Charles] Lyell regarded the earth as a self-regulating geological machine. ... In fact, [Alfred Russel] Wallace, in explaining

natural selection, stated that ‘the action of this principle is exactly like that of the centrifugal governor of the steam engine’” (“Scientists as Intellectuals: The Early Victorians,” in *Victorian Science and Victorian Values: Literary Perspectives*, ed. James Paradis and Thomas Postlewait [New York: New York Academy of Sciences, 1981], 14).

¹³⁵ Elizabeth Langland, *Nobody’s Angels: Middle-Class Women and Domestic Ideology in Victorian Culture* (Ithaca: Cornell University Press, 1995), 45. William D. Andrews and Deborah C. Andrews made similar statements in the American context, although their arguments were exploratory, presented at an early stage in the study of domestic life. They noted, however, that “by applying the methods of scientists and engineers to their household management, women were ‘borrowing some of the professional status that accrued to the masters of technology’” (“Technology and the Housewife in Nineteenth-Century America,” *Women’s Studies* 2 [1974]: 318).

¹³⁶ Caddy, 102. As Eliza Warren explained, “From the moment a bride takes possession of her house her chief duties in life commence; it is hers to form her machinery for action, to keep it in working gear, and to so ornament it by her own graces and accomplishments that the wheels and other motive power be hidden” (*How I Managed My House on £200 [One Thousand Dollars] a Year* [Boston: Loring, 1866], 93).

¹³⁷ Rumford, 5:745-46.

¹³⁸ He does, however, suggest that his advances the understanding of colour might help ladies furnish rooms or choose attractive ribbons for their gowns (Rumford, 5:67)

Chapter 3: Household Management

¹ A version of this chapter has been submitted for publication.

² M.B.H., *Home Truths for Home Peace, or “Muddle” Defeated*, 2nd ed. (London: Effingham Wilson, 1852), 56.

³ Maxine Berg, introduction to *Technology and Toil in Nineteenth-Century Britain* (London: CSE Books, 1979), 5-6.

⁴ L.S. Jacyna, “Scientific Naturalism in Victorian Britain: An Essay in the Social History of Ideas” (PhD thesis, University of Edinburgh, 1980), 304-9, cited in Simon Schaffer, “Metrology, Metrification, and Victorian Values,” in *Victorian Science in Context*, ed. Bernard Lightman (Chicago: University of Chicago Press, 1997), 467.

⁵ Gregory Clark, “Factory Discipline,” *Journal of Economic History* 54, no. 1 (1994): 128.

⁶ Erich Roll, *An Early Experiment in Industrial Organization: Being a History of the Firm of Boulton and Watt, 1775-1805* (London: Longmans, Green and Co., 1930), 155.

⁷ Roll, 5, 9, 179-80.

⁸ Clark, 129.

- ⁹ L. Urwick and E.F.L. Brech, *The Making of Scientific Management*, vol. 2, *Management in British Industry* (London: Sir Isaac Pitman and Sons, 1964), 11.
- ¹⁰ Sidney Pollard, *The Genesis of Modern Management: A Study of the Industrial Revolution in Great Britain* (London: Edward Arnold, 1965), 183; Andrew Ure, *The Philosophy of Manufactures: or, an Exposition of the Scientific, Moral, and Commercial Economy of the Factory System of Great Britain* (London: Charles Knight, 1835), 15.
- ¹¹ Robert Owen, *A New View of Society, Or, Essays on the Formation of the Human Character* (London: Cadell and Davies, 1813), Essay Third, 6; also quoted in Urwick and Brech, 57.
- ¹² "Visit to New Lanark," *Leeds Mercury* (11 September 1819): 3.
- ¹³ Bridget Hill, *Servants: English Domesticity in the Eighteenth Century* (Oxford: Oxford University Press, 1996).
- ¹⁴ M.B.H., 87.
- ¹⁵ Mrs A.G.F. Eliot James, *Our Servants: Their Duties to Us and Ours to Them* (London: Ward, Locke and Co., [1883]), 39-40. The level to which servants might be unthinking is expressed in manuals for teaching housekeeping to working class girls. The instructions are extremely detailed: "Rub the boards dry with a coarse cotton cloth. Then move to the next space within your reach" (W.B. Tegetmeier, *A Manual of Domestic Economy*, 4th ed. [London: Home and Colonial School Society, 1858], 19). Of course, these books do not consider the emotional and social importance of rebellion, especially since efficient work might only lead the penny-pinching mistress to load more tasks upon the servant.
- ¹⁶ Cre-fydd, *The Young Housewife's Daily Assistant* (London: Simpkin, Marshall, and Co., 1864), 315.
- ¹⁷ For a discussion of these attempts at moral training and edification, see, for example, Pamela Horn, *The Rise and Fall of the Victorian Servant* (Dublin: Gill and MacMillan, 1975), especially 106-115. For pauper and former criminal servants, see F. K. Prochaska, "Female Philanthropy and Domestic Service in Victorian England," *Bulletin of the Institute of Historical Research* 54, no. 129 (1981): 79-85.
- ¹⁸ Pollard, in fact, argues that these two approaches to workers are fully compatible. "The conclusion cannot be avoided that, with some honourable exceptions, the drive to raise the level of respectability and morality among the working classes was not undertaken for their own sakes, but primarily, or even exclusively, as an aspect of building up a new factory discipline" (197).
- ¹⁹ Robert Bell, *The Ladder of Gold: An English Story* (London: Richard Bentley, 1850), 2:216.
- ²⁰ *The Servants' Practical Guide* (London: Warne and Co., 1880), 1, quoted in Horn, 17.
- ²¹ Although she does not elaborate, Theresa M. McBride is correct in saying that "the employment of servants initiated the middle-class woman into the role of employer/manager and initiated her into certain professional skills" (*The*

Domestic Revolution: The Modernisation of Household Service in England and France 1820-1920 [New York: Holmes & Meier, 1976], 117).

²² Mary Booth, quoted in Jenni Calder, *The Victorian Home* (London: B.T. Batsford, 1977), 150.

²³ Mrs [Eliza] Warren, *How I Managed My House on £200 (One Thousand Dollars) a Year* (Boston: Loring, 1866), 37.

²⁴ Both household management guides and factory guides expressed this. Mrs [Eliza] Warren, for example, declared that knowing how things ought to be done would help her “hold the power of mastership in her own hands, and be able to create comfort for her household, and a reward for herself in the well-being of her family” (*Comfort for Small Incomes* [London: Office of the Ladies’ Treasury, 1866], vii). Elsewhere, she said that “this knowledge is the oil by which the domestic machinery effectively and noiselessly revolves in its daily work. It is true she may never actually perform the work herself, but in the present day she must certainly teach her servant, or there will be no comfort in her house” (Warren, *How I Managed*, 5). The manager of a cotton mill was told the same: “the manager who knows his business, can both give directions to those that are under him, as well as discern whether they are qualified for the situations they occupy, and when they fail in their duty” (James Montgomery, *On the Theory and Practice of Cotton Spinning* (Glasgow, 1836), extract in *Technology and Toil in Nineteenth Century Britain*, ed. Maxine Berg (London: CSE Books, 1979), 58.

²⁵ Elizabeth Langland, “Nobody’s Angels: Domestic Ideology and Middle-Class Women in the Victorian Novel,” *PMLA* 107, no. 2 (1992): 294. Langland writes this in the context of clothing, but the argument applies to general domestic management, too.

²⁶ Mrs [Sarah Stickney] Ellis, *The Women of England, their Social Duties, and Domestic Habits* (New York: D. Appleton & Co., 1839), 142.

²⁷ Without careful calculation and prompt, energetic, and benevolent action on the part of the mistress, Ellis declared, “the machinery of household comfort is arrested in its movements” (24).

²⁸ E.L.L. [Eliza Lynn Linton], “On the Side of Maids,” *The Cornhill Magazine* 29 (1874): 301.

²⁹ Linton, 299.

³⁰ Linton, 306-7.

³¹ Linton, 304. Trade unions mostly failed to attract domestic servants. As Leonore Davidoff points out, servants, as well as mistresses, were too isolated to form a class (“Mastered for Life: Servant and Wife in Victorian and Edwardian England,” *Journal of Social History* 7, no. 4 [1974]: 420). Even without trade unions, however, servants managed to intimidate their mistresses. Jane Carlyle confessed a fear of giving orders in the kitchen “amidst the scowls of *women in pinafores* and suppressed cries of ‘*à bas la systeme*’” (to Thomas Carlyle, 7 April 1848, in *The Carlyle Letters Online*). She also complained that two servants made a unionized “we” as opposed to the more familial “we” of the single servant (to

Mary Russell, 1860, quoted in Thea Holme, *The Carlyles at Home* [London: Oxford University Press, 1965], 172-73).

³² Elizabeth L. Banks, *Campaigns of Curiosity: Journalistic Adventures of an American Girl in Late Victorian London*, facsimile ed. of *Campaigns of Curiosity: Journalistic Adventures of an American Girl in London* (1894; Madison: University of Wisconsin Press, 2003), 92.

³³ Banks, 50. Domestic service in fact lagged behind other occupations in terms of payment systems. While truck was largely replaced by wages in most industries by 1850, beer money and perquisites like dripping, bones, broken meats, and poundage – gratuities or commissions from the tradesmen – continued among domestic servants. These were debated through the century. Some mistresses took them as a given, while others objected to beer money on temperance grounds, or felt that perquisites encouraged dishonesty and waste. Elizabeth Langland sums up the issue nicely: “The argument against perquisites (which is an argument against custom and in favor of a more ‘rationalized’ method of doing things) recalls what E.P. Thompson describes in *The Making of the English Working Class* as the conflict between customary traditions and (supposedly) rational agricultural and industrial policies in the late eighteenth and early nineteenth centuries. The terms of the debate (e.g. the identification of ‘custom’ with irrationality and counterproductivity), of course, represent middle-class ideology, not inevitable historical development” (*Nobody’s Angels: Middle-Class Women and Domestic Ideology in Victorian Culture* [Ithaca: Cornell University Press, 1995], 48fn.).

³⁴ McBride, 29.

³⁵ William Kitchiner, *The Cook’s Oracle* (New York: J & J Harper, 1830), 62-63.

³⁶ Cre-fydd, 313-14. Household guides also recommended weekly and half-yearly routines (Jane Stoker, *Home Comfort: A Complete Manual of Domestic Economy* [London: W. Stewart & Co.?, 1876?], 40).

³⁷ James, 41-42; Julia McNair Wright, *The Complete Home: An Encyclopedia of Domestic Life and Affairs* (Philadelphia: J.C. McCurdy & Co., 1879), 352; Kitchiner, 62.

³⁸ A Lady [Maria Rundell], *A New System of Domestic Cookery formed upon Principles of Economy*, new ed. (London: John Murray, 1808), xi, xii.

³⁹ Wright, 342. See also Mrs [Florence] Caddy, *Household Organization* (London: Chapman and Hall, 1877): “[B]y careful fitting and steady guidance, the wheels of the domestic machine may run smoothly and noiselessly in their groves, especially if the oil of good humour be plentifully supplied” (102). As Mary Ashford similarly wrote, “I worked very hard, but my mistress, who was an excellent manager, regulated my work, so that I took no harm” (*Life of a Licensed Victualler’s Daughter* [London: Saunders & Otley, 1844], 35, quoted in Hill, 201).

⁴⁰ Charles Babbage, *On the Economy of Machinery and Manufactures* (London: Knight, 1832), 45.

- ⁴¹ David S. Landes, *Revolution in Time: Clocks and the Making of the Modern World*, 2nd ed. (London: Viking, 2000), 338-39; Thomas Webster and Mrs [Frances] Parkes, *An Encyclopædia of Domestic Economy* (London: Longman, Brown, Green, and Longmans, 1852), 849.
- ⁴² These terms are from E.P. Thompson, "Time, Work-Discipline and Industrial Capitalism," in *Customs in Common* (London: The Merlin Press, 1991), 358.
- ⁴³ Sara Pennell, "'Pots and Pans History': The Material Culture of the Kitchen in Early Modern England," *Journal of Design History* 11, no. 3 (1998): 205; Lorna Weatherill, *Consumer Behaviour and Material Culture in Britain, 1660-1760*, 2nd ed. (London: Routledge, 1996), table 4.4, page 88. The lack of nineteenth-century probate inventories unfortunately makes it difficult to extend this study.
- ⁴⁴ Mark Overton, Jane Whittle, Darron Dean, and Andrew Ham, *Production and Consumption in English Households, 1600-1750* (London: Routledge, 2004), 111, 135-36.
- ⁴⁵ Overton, Whittle, Dean, and Ham, 169.
- ⁴⁶ Neil McKendrick, "Josiah Wedgwood and Factory Discipline," *The Historical Journal* 4, no. 1 (1961): 40-41.
- ⁴⁷ McKendrick, 44.
- ⁴⁸ McKendrick, 38.
- ⁴⁹ McKendrick, 32; Josiah Wedgwood to Thomas Bentley, 9 October [1769], quoted in McKendrick, 34. Interestingly, despite a general corporate secrecy, Boulton explained his financial and business organization to Wedgwood, and as a result Etruria had very minutely divided labour and factory discipline and control (Pollard, 261).
- ⁵⁰ McKendrick, 50, 42-43.
- ⁵¹ Lavinia Swainbank in *Useful Toil: Autobiographies of Working People from the 1820s to the 1920s*, ed. John Burnett (1974; London: Routledge, 1994), 223-24.
- ⁵² Leonore Davidoff and Catherine Hall, *Family Fortunes: Men and Women of the English Middle Class 1780-1850*, rev. ed. (1987; London: Routledge, 2002), 390.
- ⁵³ Ellen (Nellie) Weeton [Stock], quoted in Alan Roby, "Ellen Weeton (1776-1849), Governess: 'Spare the Rod and Spoil the Child,'" *Past Forward* 26 (2000): 10-11, <http://www.wlct.org/culture/heritage/pf26.pdf>. Jean Rennie described similar coordination in her work in the 1920s: "I gradually learned whose job was which, and that one must not do anyone else's job. Not even to help them. So nobody helped me" (*Every Other Sunday* [London: Arthur Barker, 1955], extract in *Useful Toil: Autobiographies of Working People from the 1820s to the 1920s*, ed. John Burnett [1974; London: Routledge, 1994], 244).
- ⁵⁴ Webster and Parkes, 336.
- ⁵⁵ Mrs Henry [Christine] Reeve, *Cookery and Housekeeping* (London: Longmans, Green, and Co., 1882), 33.
- ⁵⁶ Babbage, 169.
- ⁵⁷ John Seed, "From 'Middling Sort' to Middle Class in Late Eighteenth- and Early Nineteenth-Century England," in *Social Orders and Social Classes in*

Europe since 1500: Studies in Social Stratification, ed. M.L. Bush (London: Longman, 1992), 126-27.

⁵⁸ Babbage, 201.

⁵⁹ “The time has gone that allowed an *impassable* line of division to exist between the services to be performed by the differently-styled servants in a family, and many valuable domestics find an interest in knowing how, upon occasions, to take in hand some work that may be said not to belong to their department” (*Young Housekeeper’s Essential Aid to the Thorough Understanding of the Duties of her Maidservants* [London: (Thomas Dean and Son), (1852)], i). The link between estate and household management was quite strong. While there were few guides for industrial managers before about 1830, estate management guides, like household management guides, were common (Pollard, 27). One can certainly interpret the division of labour in the factory as an extension of the division of labour between dairy-maids, laundry-maids, and other servants on an estate, too.

⁶⁰ Holme, 33.

⁶¹ Davidoff and Hall, 343, 383.

⁶² Babbage, 27; Davidoff and Hall, 172.

⁶³ C.G. Hey, “Rowland Hill and Hazelwood School, Birmingham,” Birmingham Reference Library 660912, 14, quoted in Davidoff and Hall, 238.

⁶⁴ *A New System of Practical Domestic Economy; Founded on Modern Discoveries, and the Private Communications of Persons of Experience*, new ed. (London: Henry Colburn, 1827), 380. While “[i]t has been argued that Evangelical morality was probably the most widespread influence in Victorian England” (Catherine Hall, *White, Male, and Middle Class: Explorations in Feminism and History* [Cambridge: Polity Press, 1992], 75), S.S. Schweber notes that “By the 1830s, the tide of Evangelicalism was ebbing, but evangelical Christianity had affected the frame of mind of most middle- and upper-middle-class Englishmen For the intellectual elite, religion was becoming grounded in ethical life rather than in metaphysical claims regarding revelation and cognition” (“Scientists as Intellectuals: The Early Victorians,” in *Victorian Science and Victorian Values: Literary Perspectives*, ed. James Paradis and Thomas Postlewait [New York: New York Academy of Sciences, 1981], 18).

⁶⁵ Warren, *How I Managed*, 45.

⁶⁶ A Lady, *Common Sense for Housemaids*, 2nd ed. (London: T. Hatchard, 1853), 86.

⁶⁷ A Lady [Rundell], xvii.

⁶⁸ Charles Pierce, *The Household Manager: Being a Practical Treatise upon the Various Duties in Large or Small Establishments, from the Drawing-Room to the Kitchen* (London: Routledge, 1857), 351-52.

⁶⁹ Cre-fydd, 313-14; M.B.H., 88.

⁷⁰ Cre-fydd, 315.

⁷¹ A Lady [Rundell], xvii

⁷² A Lady [Rundell], xiv-xv; Mary Jewry, *Warne’s Model Cookery and Housekeeping Book*, new ed. (London: Warne & Co., [1870]), 9.

- ⁷³ A Lady [Rundell], xiii-xiv.
- ⁷⁴ Mrs [Ann Martin] Taylor, *Practical Hints to Young Females*, 10th ed. (London: Taylor and Hessey, 1822), 30.
- ⁷⁵ Joseph Lancaster, *Improvements in Education, as it Respects the Industrious Classes of the Community* (London: Darton and Harvey, J. Matthews, 1803), <http://www.constitution.org/lanc/improv-1803.htm>.
- ⁷⁶ George Dodd, *Days at the Factories* (London: Charles Knight, 1843), 533; “A Day at a Copper and Lead Factory” (526-548) also extracted in *Technology and Toil in Nineteenth-Century Britain*, ed. Maxine Berg (London: CSE Books, 1979), 55-58.
- ⁷⁷ Dodd, 57-58.
- ⁷⁸ A Lady, *The Lady’s Guide to the Ordering of her Household, and the Economy of the Dinner Table* (London: Smith, Elder & Co., 1861), 483-85, quoted in S.P. Walker, “How to Secure our Husband’s Esteem. Accounting and Private Patriarchy in the British Middle Class Household During the Nineteenth Century,” *Accounting, Organizations and Society* 23, no. 5/6 (1998): 493.
- ⁷⁹ “Visit to New Lanark.”
- ⁸⁰ Pollard, 198.
- ⁸¹ Seed, 126, citing Gareth Stedman Jones, *Outcast London: A Study in the Relationship Between Classes in Victorian Society* (Oxford: Clarendon Press, 1971), 374. Seed goes on to say that “Large-scale industrial employers were few and far between and largely restricted to engineering, tanning, building, and silk-manufacturing” (126).
- ⁸² Alfred D. Chandler, Jr., “The Emergence of Managerial Capitalism,” *The Business History Review* 58, no. 4 (1984): 473.
- ⁸³ Robert Owen, *The Life of Robert Owen: Written by Himself* (London: Effingham Wilson, 1857), 1:28; also quoted in Urwick and Brech, 45.
- ⁸⁴ Jane Welsh Carlyle’s Journal, 16 November 1855, in *The Carlyle Letters Online*; Jane Welsh Carlyle to Thomas Carlyle, 7 April 1848, in *The Carlyle Letters Online*.
- ⁸⁵ Beverly Lemire, “Accounting for the Household: Gender and the Culture of Household Management, c. 1600-1900,” in *The Business of Everyday Life: Gender, Practice and Social Politics in England, c. 1600-1900*, 187-226 (Manchester: Manchester University Press, 2005).
- ⁸⁶ Davidoff and Hall, 203.
- ⁸⁷ Mrs [Sarah Stickney] Ellis, *The Daughters of England, their Position in Society, Character and Responsibilities* (New York: D. Appleton & Co., 1843), 205-6.
- ⁸⁸ Davidoff and Hall, 383.
- ⁸⁹ These include textile, engineering, cutlery, pottery, shipbuilding, brewing, house-building, and clothing trades, as well as the Birmingham trades (Seed, 130).
- ⁹⁰ Priscilla Wakefield, *Reflections on the Present Condition of the Female Sex; with Suggestions for its Improvement* (London: J. Johnson and Darton and Harvey, 1798), 100. She in fact called these wives the second class, “those, who

by the application of their talents to learning, commerce, manufactures or agriculture, procure a respectable subsistence approaching to opulence” (63).

⁹¹ Wakefield, 101-2; see, for example, Jewry, 1-2 for portion estimates.

⁹² Wakefield, 118-19

⁹³ Wakefield, 106.

⁹⁴ M. Radcliffe, *A Modern System of Domestic Cookery* (Manchester: J. Gleave, 1823), 2. See also A Lady [Rundell]: “Many families have owed their prosperity full as much to the propriety of female management, as to the knowledge and activity of the father” (viii).

⁹⁵ Mrs [Matilda Marian] Pullan, *Maternal Counsels to a Daughter* (London: Darton and Co., 1855), 7.

⁹⁶ William Kitchiner, *The Housekeeper’s Ledger* (London: Hurst, Robinson, and Co.; G.B. Whitaker; and Archibald Constable and Co., 1825), 48.

⁹⁷ Helen Berry, “Women, Consumption and Taste,” in *Women’s History: Britain, 1700-1850, An Introduction*, ed. Hannah Barker and Elaine Chalus (London: Routledge, 2005), 203.

⁹⁸ Davidoff and Hall, 384; John Tosh, *A Man’s Place: Masculinity and the Middle-Class Home in Victorian England* (New Haven: Yale University Press, 1999), 63.

⁹⁹ Davidoff and Hall, 267.

¹⁰⁰ Lemire, 194.

¹⁰¹ See Warren: “The best check against unnecessary expenditure is to let your husband see the bills every week, although the wife alone pays them” (*How I Managed*, 49). James Luckcock recommended that the husband take over the larger accounts (*Hints for Practical Economy* [Birmingham: James Drake, and London: Longman, Rees, Orme, Brown, Green, 1834], 18).

¹⁰² “The Englishwoman’s Conversazione,” *The Englishwoman’s Domestic Magazine* 83 (November 1871): 318. For an example of partnership, see Luckcock: “Let the husband encourage by kindness the disposition for method and punctuality – let him affectionately assist in removing difficulties, or balancing the accounts – and that task which is now but too generally considered as a bugbear, will become a satisfaction and a pleasure to both” (17).

¹⁰³ Tosh, 63.

¹⁰⁴ “Court for Divorce and Matrimonial Causes, Nov. 26, Kelly V. Kelly,” *The Times* (27 November 1869): 11, col. A.

¹⁰⁵ “Court of Probate and Divorce, Dec. 7, Kelly V. Kelly. – Judgment,” *The Times* (8 December 1869): 11, col. B; also quoted in A. James Hammerton, *Cruelty and Companionship: Conflict in Nineteenth-Century Married Life* (London: Routledge, 1992), 98.

¹⁰⁶ Richard Grant White, *England Without and Within* (London: Sampson Low, Marston, Searle & Rivington, 1881), 208.

¹⁰⁷ [Dinah Craik], *A Woman’s Thoughts about Women* (Leipzig: Bernard Tauchnitz, 1860), 117.

¹⁰⁸ Ian Hacking, *The Taming of Chance* (Cambridge: Cambridge University Press, 1990), 140.

¹⁰⁹ Luckcock, 10, 12.

¹¹⁰ Luckcock, 27, 18. This “self-denial” may partly explain budgeting’s religious connotations.

¹¹¹ Luckcock, 22-23. In fact, at his retirement Luckcock was forced to sell his business on unfavourable terms; he knew the value of a budget (Davidoff and Hall, 16).

¹¹² William MacKenzie, *A Concise and Easy System of Book-Keeping, for Solicitors, &c.* (London: Law Times Office, 1858), 1.

¹¹³ MacKenzie, 3. Moreover, many professionals were in fact involved in commerce as well. Seed observes that “the distinction between ‘profession’ and ‘business’, as if they were two quite autonomous spheres, can easily be overdrawn. Members of the legal profession were frequently involved in a range of economic activities based upon the management of capital and labour. This was equally true of the medical profession.” A doctor might also manage his family’s chemical manufacturing firm, be engaged in scientific research, or provide scientific consulting for local industrialists. Many were also involved in property development (120).

¹¹⁴ Kitchiner, *Ledger*, 44-47.

¹¹⁵ Kitchiner, *Ledger*, 2.

¹¹⁶ Michael Chatfield, *A History of Accounting* (Hinsdale, IL: Dryden Press, 1974), 93.

¹¹⁷ The idea of a Great Depression lasting from 1873 to 1896, which economic historians debated heavily in the 1950s and 60s, has now fallen out of fashion. There is, however, little doubt that in this approximate period there was a general slowing of world trade in manufactures, and Britain’s share of this trade was falling. The country experienced a deceleration of industrial growth and productivity, a decrease in investment, and some problems with export trade, agriculture (particularly falling grain prices), and unemployment. See, for instance, A.E. Musson, “The Great Depression in Britain, 1873-1896: a Reappraisal,” *The Journal of Economic History* 19, no. 2 (1959): 199-228 and “British Industrial Growth during the ‘Great Depression’ (1873-96): Some Comments,” *The Economic History Review*, n.s. 15, no. 3 (1963): 529-33; and T.W. Fletcher, “The Great Depression of English Agriculture 1873-1896,” *The Economic History Review*, n.s. 13, no. 3 (1961): 417-32.

¹¹⁸ Caddy, ix.

¹¹⁹ Caddy, x.

¹²⁰ Caddy, 3.

¹²¹ Caddy, 5.

¹²² Davidoff and Hall, 205.

¹²³ [Craik], 5. Langland has, however, argued that domestic management gave women such as Florence Nightingale the confidence and skills they needed to work outside the home (*Nobody’s Angels*, 49).

¹²⁴ He wrote, “if women were, from the highest to the lowest, more systematically educated to wield properly the great amount of power they *do* possess, and if they were habituated actively and energetically to enter into that portion of the business of life which is their own peculiar sphere, this world would be a much happier and better one” ([R.K. Philp, ed.], *The Practical Housewife: A Complete Encyclopædia of Domestic Economy and Family Medical Guide* [London: Houlston and Wright, (1860?)], 2).

¹²⁵ Samuel Adams and Sarah Adams, *The Complete Servant* (London: Knight and Lacey, 1825), 14.

¹²⁶ “The Model Daughter,” *Punch* (3 June 1848): 230. The dowdy reputation was true of management, too: “In very many houses, especially in those ordered on old-fashioned principles, a plan of daily, weekly and even monthly routine is drawn up and the work done by it. It is a pity that such is not the case in all modern houses, more particularly those of the middle classes, as things would go on much more smoothly and easily if it were so” (James, 40).

¹²⁷ The situation was slightly different for the “industrious” classes. Efforts to spread budgeting there, for instance, might appeal to masculinity, with the middle-class industrialist as a model. “House-keeping Accounts” in *The Family Economist*, a penny monthly, expressed as much, beginning with a paean to order, the means of Victorian industrial and technological success, then asking “how is it that railway directors, manufacturers, and tradesmen are able to keep up such a system of order? ... It is because they keep a regular account of all their business transactions written down in books” (4 [1851]: 3-4). “You have as many hands and eyes as a flourishing tradesman, and why should you not flourish as well as he? The difference is that he uses his head, and you don’t” (4).

¹²⁸ Pollard, 209-11; Mary Poovey, *A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society* (Chicago: University of Chicago Press, 1998), 38-39.

¹²⁹ Chatfield, 105-6.

¹³⁰ Roll, 250.

¹³¹ Roll, 252.

¹³² Chatfield 99-102; H. Thomas Johnson, “Toward a New Understanding of Nineteenth-Century Cost Accounting,” *The Accounting Review* 56, no. 3 (1981): 513-14. Soho used bookkeeping to determine prices, wages, technical changes, and adjustments to work and payments. Wedgwood, too, examined the books to determine which departments were profitable (Pollard, 247).

¹³³ Caddy, ix. See also Mrs [Mary] Haweis, *The Art of Housekeeping: A Bridal Garland* (London: Sampson, 1889): “People keep too many servants, chiefly because mistresses do not take the trouble to calculate how much work can be properly done by one person” (79-80).

¹³⁴ “Trickett’s Improved Patent Economic Peeler & Slicer” advertisement, c. 1885, Evanion Collection 6046, The British Library.

¹³⁵ Warren, *How I Managed*, 82

¹³⁶ Warren, *Comfort*, 57.

¹³⁷ Warren, *Comfort*, 60.

¹³⁸ Warren, *Comfort*, 61.

¹³⁹ [R.K. Philp, ed.], *Enquire Within upon Everything* (London: Houlston and Stoneman, 1856), 190.

¹⁴⁰ M. Bayly, *The Life and Letters of Mrs Sewell* (London: J. Nisbet & Co., 1889), 104, quoted in Davidoff and Hall, 281.

¹⁴¹ Catherine Hall, personal communication, cited in Tosh, 17.

¹⁴² Stana Nenadic, "Businessmen, the Urban Middle Classes, and the 'Dominance' of Manufacturers in Nineteenth-Century Britain," *The Economic History Review*, n.s. 44, no. 1 (1991): 78-79. James Watt II was notoriously private (Jack Morrell and Arnold Thackray, *Gentlemen of Science: Early Years of the British Association for the Advancement of Science* [Oxford: Clarendon Press, 1981], 264), but Pollard also describes the "widespread consensus of opinion that Owen's success as a manufacturer was largely due to the orderliness of his factory." Both he and Arkwright had model mills and welcomed visitors (260).

¹⁴³ Ellis, *Women of England*, 262.

¹⁴⁴ Samuel Smiles, *Character* (Chicago: Belford, Clarke & Co., 1881), 67.

¹⁴⁵ "An Old Bohemian" [Gustave Strauss], *Dishes and Drinks; or, Philosophy in the Kitchen*, rev. ed. (London: Ward & Downey, 1887), 14. The home's business engagement was manifested in other ways, as well. Obviously, it was critically engaged in a process of consumption, and many domestic items, as well as the places where they could be purchased, were puffed in household management guides. An illustrative example has been well researched by Kathryn Hughes. Observing that Isabella Beeton's *Book of Household Management* gives special attention to equipment "supplied by Messrs. Richard & John Slack, 336, Strand, London" (1861; facsimile 1st ed. [London: Jonathan Cape, 1969], e.g. 27), Hughes reveals that the Slacks' business was only a few hundred yards away from Beeton's Bouverie Street Office. Beeton also provides a list of basic kitchen tools lifted directly from the Slacks' catalogue (*The Short Life & Long Times of Mrs Beeton* [2005; London: Harper Perennial, 2006], 151). Although the details of the deal remain unknown, it is clear that this plug was a business move. Similarly, a puff for "March's 'Family Book-keeper,'" in Rundell's book may have been a business deal between her publisher, John Murray, and March and Son; the latter business on Ludgate Street was not far from Murray's Fleet Street office (A Lady [Rundell], viii). Other examples of the home's engagement with the economic community are more subtle. In his essay on *Household Management*, James Buzard points out that Beeton saw her home within the larger economic context. The mistress must literally "compete" with the attractions of the "clubs, well-ordered taverns, and dining-houses" that draw the husband away ("Home Ec. with Mrs. Beeton," *Raritan* 17, no. 2 [1997]: n.p., Academic Search Complete, quoting Beeton, iii).

¹⁴⁶ Banks, 87, 33, 66.

¹⁴⁷ Ellis, *Women of England*, 25-26.

¹⁴⁸ John E. Crowley, *The Invention of Comfort: Sensibilities and Design in Early Modern Britain & Early America* (Baltimore: The Johns Hopkins University Press, 2001), 292. Crowley also observes that “As the value of physical comfort became more explicit and desirable, the technology of its improvement gained intellectual prestige”; he looks in particular at stoves and lamps in Chapter 6 of the book (171-200).

¹⁴⁹ See Arthur Freeling, *The Young Bride’s Book: Being Hints for Regulating the Conduct of Married Women* (London: H. Washbourne, 1839): “If your husband is a man of order, how much of your happiness may hinge on attention, regular attention, to your household duties. How soon his eye will detect the absence of a controlling, governing, and sufficient power” (54). Philp also explained that tired husbands did not wish to know about domestic minutiae (*Practical Housewife*, 2). Craik joked that comfort actually began when the husband left: “[Is it] not the greatest comfort possible when, the masculine half of the family being cleared out for the day, the house settles down into regular work and orderly quietness until evening?” However, she went on to acknowledge the importance of giving her partner a restful retreat (119).

¹⁵⁰ James, 32-33.

¹⁵¹ A Lady [Rundell], ii.

¹⁵² William M. Reddy, “The Concept of Class,” in *Social Orders and Social Classes in Europe since 1500: Studies in Social Stratification*, ed. M.L. Bush (London: Longman, 1992), 16.

¹⁵³ Michel Foucault, *Discipline and Punish: The Birth of the Prison*, trans. Alan Sheridan (New York: Vintage Books, 1995), 218.

¹⁵⁴ Foucault, 209.

¹⁵⁵ Foucault, 150, 189.

¹⁵⁶ Foucault, 176-77.

¹⁵⁷ Foucault, 207. It is worth noting here that Samuel Bentham developed the panopticon in the context of his design of large-scale workshops and factories in Russia. His brother Jeremy borrowed the idea for prisons and workhouses. Both involved supervision, metal “conversation tubes,” and the expectation of turning a profit (Struan Jacobson, *Science and British Liberalism: Locke, Bentham, Mill and Popper* [Aldershot: Avebury, 1991], 91, 94). Managers were expected to supervise not just their own panopticons, but each others’, comparable perhaps to the practice of paying calls (95). Managers would also keep detailed books for the consultation of all interested parties (95).

¹⁵⁸ Miss [Eliza] Leslie, *The House Book: or, a Manual of Domestic Economy* (Philadelphia: Carey and Hart, 1840), 227.

¹⁵⁹ Foucault, 197.

¹⁶⁰ Some historians have argued that scientific management did not begin until about the turn of the twentieth century, but Roll puts its origins much earlier. He quotes A. Marshall’s definition: “a method of redistributing and reorganising the functions and the mutual relations of the personnel of a great business, with the purpose of increasing aggregate efficiency by narrowing the range of

responsibility of its employees and bringing careful studies to bear on the instructions given in regard to the simplest manual operations” (*Industry and Trade* [1923], 368, quoted in Roll, 185). These studies involve breaking the problem into its constituent elements and collecting data that can then be analysed in order to make improvements. Boulton and Watt did this, looking systematically and technically at production and profits (Roll, 185-86), as did the middle-class home.

¹⁶¹ Davidoff and Hall, 420. Monica F. Cohen suggests the same thing, arguing that nineteenth-century housekeeping was “a representation of work capable of alleviating some of the religious anxieties belonging to the kind of Protestant culture Weber describes. As busyness, housework can figure as a methodical, systematized engagement with the materials of the world.” It is also continuous and unpaid, practically proving a state of grace or calling (and thus election) (*Professional Domesticity in the Victorian Novel: Women, Work and Home* [Cambridge: Cambridge University Press, 1998], 91). She also identifies “a spiritually inflected vocabulary of professionalism. In the context of this vocabulary, domesticity is not a leisure pursuit, not an antithesis to industrial production; the home not an antidote to the capitalist workplace or a place of material consumption or bourgeois sport. Rather it is, in nineteenth-century terms, a vocational profession” (139). Cohen gives little attention, however, to the physical manifestation of this professionalism.

Conclusion

¹ E[liza] Lynn Linton, “Womanliness,” in *The Girl of the Period and other Social Essays* (London: Richard Bentley & Son, 1883), 2:110.

² “Domestic Science,” *Punch* 678 (8 July 1854): n.p.

³ Edward L. Youmans, *The Hand-Book of Household Science. A Popular Account of Heat, Light, Air, Aliment, and Cleansing, in their Scientific Principles and Domestic Applications* (New York: Appleton, 1858).

⁴ William H. Brock identifies these as two core aspects of professionalization in “Advancing Science: The British Association and the Professional Practice of Science” (1981), repr. in *Science for All: Studies in the History of Victorian Science and Education*, (Aldershot, Hampshire: Variorum, 1996), II: 91.

⁵ Deborah Valenze, “The Art of Women and the Business of Men: Women’s Work and the Dairy Industry c. 1740-1840,” *Past and Present* 130 (1991): 142-69.

⁶ Jan Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992), 284.

⁷ Burton J. Bledstein, *The Culture of Professionalism: The Middle Class and the Development of Higher Education in America* (New York: Norton, 1976), 87.

⁸ Bledstein, 88-89.

⁹ Bledstein, 118.

¹⁰ Mrs [Sarah Stickney] Ellis, *The Women of England, Their Social Duties, and Domestic Habits* (New York: Appleton, 1839), 139.

¹¹ Monica F. Cohen, *Professional Domesticity in the Victorian Novel: Women, Work and Home* (Cambridge: Cambridge University Press, 1998), 136.

¹² *The Census of Great Britain in 1851; Comprising an Account of the Numbers and Distribution of the People, their Ages, Conjugal Condition, Occupations, and Birthplace ... Reprinted, in a Condensed Form, from the Official Reports and Tables* (London: Longman, Brown, Green, and Longmans, 1854), 64.

¹³ For the segregation argument, see Martin A. Danahay, *Gender at Work in Victorian Culture: Literature, Art, and Masculinity* (Aldershot: Ashgate, 2005), 76-77.

¹⁴ *Census*, 64.

¹⁵ Cohen, 91-92.

¹⁶ Jane Welsh Carlyle to Jeannie Welsh, 14 May 1844, in *The Carlyle Letters Online*.

¹⁷ The post-World War I period was important for household management, as electricity increased the number of appliances, and Americans Christine Frederick and Lillian Gilbreth, for example, studied housework scientifically, reducing it to individual motions that could be made more efficient. However, the principles behind these changes were established much earlier.

¹⁸ Nicola Humble, *Culinary Pleasures: Cook Books and the Transformation of British Food* (London: Faber and Faber, 2005), 27.

¹⁹ Charles Pierce, *The Household Manager: Being a Practical Treatise upon the Various Duties in Large or Small Establishments, from the Drawing-Room to the Kitchen* (London: Routledge, 1857).

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