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Abstract

The modern world has involved an unprecedented ballooning of stuff. How can historians make sense of this massive surge? This chapter offers some conceptual and methodological tools and suggestions. Instead of opting for either micro or macro histories, it argues that we need to move between these scales to capture, analyse, and explain the forces that drive greater consumption. The chapter links locally situated material culture with the aggregate global analysis of material flows. It discusses the influence of empire and political economy on taste, norms, and conventions and reflects on the dynamics of demand in contemporary societies by showing how everyday practices, energy systems, and networked infrastructures are interdependent and need to be studied together. It challenges a neat separation between demand and supply. It complements earlier chapters on ‘long’ and ‘deep history’ and the Anthropocene by calling on historians to straddle different spatial scales of the material world.

Keywords

consumption; consumer culture; energy; everyday life; infrastructures; material culture; material flows; materiality; practices

Material Histories of the World

Scales and Dynamics

Frank Trentmann

In 1823 John Potter Hamilton was on his way to Bogotá as Britain's first commissioner to the new state of Colombia. It proved a strenuous journey. In the Valle del Cauca, on the Pacific side of the country, Hamilton's trek faced mountains, jungle, and, above all, mud. One day he and his mule got stuck in such 'deep slough' that he had to get off the animal to try and pull them both out—only to sink in deeper and deeper in the process, much to the 'merriment and amusement of my secretary, servants [and] muleteers'. This was 'rather an annoyance', he recorded in the book of his travels, because he was due to make his 'debut' at Mr and Mrs Arboleda's, a wealthy local family. Mr Arboleda duly apologized for the bad state of the roads, pointing to the surrounding red hills, where 800 of his slaves were washing the soil for gold dust. 'After making ourselves clean and comfortable, we sat down to an elegant dinner served on massy [massive] silver dishes and French china, and soon forgot all our past grievances.' Before the Civil War, Mr Arboleda had counted 10,000 heads of cattle his own. Now they were barely a tenth. Still, his estate was hardly a poorhouse. In one room, which 'he called his study', he had managed to bring together an extensive library of French, English, Italian, and of course Spanish books. When Hamilton entered his guest room, he was struck by the 'luxuries provided for the toilet which are only found among rich families in Europe'. His bed was 'completely in the French style', the curtains 'ornamented with artificial flowers'. On the table lay 'eau de Cologne, Windsor soap, *huile de Macassar* [a hair

conditioner], *crème d'amande amères* [*sic*] [an almond lotion], brushes, &c.'. In the morning a servant announced that 'a cold bath' was ready.¹

Hamilton found himself in a secluded valley in deepest Colombia, a universe far, far away from the metropolitan bustle of London and Paris; and yet he was greeted by a collection of domestic comforts and luxuries familiar from home. Travel accounts like his give us a snapshot of the material world *in situ*: individuals find and handle objects in a local setting and often describe them in fine detail. The historian who studies such a source is not so different from a visitor who presses his nose against a showcase in one of today's museums of decorative arts and design.

But this is only one perspective on the material world. A radically different vantage point is obtained by looking through the other end of the lens and seeing the material mass of the world as a whole. One way of doing this is by measuring material flows across time and space, a method developed by social ecologists and environmental economists. Each household, community, and country has material inputs and outputs—things and resources that are being sucked in while others are being spat out. National accounts measure these flows within the territories of a state. Put them together and you will find the social metabolism of the world.

This method is not perfect—no method is. For one, it does not discriminate between different types of materials; it lumps them together instead. A ton of coal carries the same weight as a ton of wool, but the former is much more harmful to the planet than the latter. Water tends to be excluded altogether in most accounts because it is heavy and its extraction, distribution, and use are so ubiquitous that adding it would render numbers meaningless; think of all the things in which water is 'embedded', such as cotton. Some households and

¹ John Potter Hamilton, *Travels through the Interior Provinces of Colombia* (London, 1827), vol. 2, 114–21.

communities have a faster metabolism than their neighbours, but this disappears in aggregates. Still, notwithstanding these and other problems, material flow analysis has the merit of giving us at least an overall sense of the total amount of stuff and material in use in the world. The twentieth century, for which we have good figures, saw a dramatic growth in material appetite.² In 2009 the world went through more than ten times as much matter as in 1900. Even when adjusted for population and taking into consideration that societies were much more efficient in 2000 in their use of goods than they were in 1900, a person today goes through twice as much material as his or her great-grandparent did.

As sources for historical study, Hamilton's *Travels* and global material use may seem worlds apart, one giving us French curtains and a bar of soap, the other gigatons of resources. But it would be wrong to try and fit them neatly into micro or macro accounts familiar to historians since the 1970s and to treat them as mutually exclusive alternatives.³ Rather we should see them as prompts to think about the linkages between the local and the global and between humans and things. The phenomenal rise in consumption and material use is a dynamic process and, to understand it, we need to reconstruct the linkages that have propelled it forward. This also requires us to take a longer and broader view of consumption. Goods

² Fridolin Krausmann, Simone Gingrich, Nina Eisenmenger, Karl-Heinz Erb, Helmut Haberl, and Marina Fischer-Kowalski, 'Growth in Global Materials Use, GDP and Population during the 20th Century', *Ecological Economics* 68.10 (2009), 2696–705. See also Marina Fischer-Kowalski et al., *Gesellschaftlicher Stoffwechsel und Kolonisierung von Natur* (Amsterdam, 1997).

³ For different points of entry into these methodological genres, see e.g. Charles Tilly, *Big Structures, Large Processes, Huge Comparisons* (New York, 1984); John Brewer, 'Microhistory and the Histories of Everyday Life', *Cultural & Social History* 7.1 (2010), 87–110; and Filippo de Vivo, 'Prospect or Refuge? Microhistory, History on the Large Scale', *Cultural & Social History* 7.3 (2010), 387–97.

have a life before and after the point of purchase; and this includes the materials that go into their making, as well as their disposal and mutation into waste. In addition to the goods in our shopping bag, we carry on our back an invisible ‘ecological rucksack’, to use the image of the climate expert Friedrich Schmidt-Bleek. This backpack contains all the materials needed to produce, deliver, and dispose of our goods, including the fuel for shipping, cooling, and heating and the tapioca and soy that feed our livestock. Looking at the backpack widens our view of material processes considerably: in addition to the contents of this or hereir shopping bags, the average person in advanced societies today uses between 45,000kg and 85,000kg of materials and resources (coal, oil, metals, minerals, grain etc.) in the course of one year.⁴ That is a lot of stuff.

In his work as in his life, Eric Hobsbawm had an ambivalent relationship with consumption. He was deeply in tune with jazz music, but jeans and other aspects of popular youth culture from the 1960s left him cold.⁵ Consumption was never absent from his writing—after all, he made the pessimist’s case in the debate about the standard of living in the late 1950s, emphasizing that there is more to quality of life than wages. The shift from luxury trades to mass consumption in textiles, too, received its mention in subsequent work. Nonetheless, industry and finance remained, for him, the drivers of capitalism, and consuming tended to appear more as an effect of these forces than as a historical phenomenon

⁴ Albert Adriaanse et al., *Resource Flows: The Material Basis of Industrial Economics* (Washington, DC, 1997).

⁵ In *The Age of Extremes* (London, 1994), Eric Hobsbawm noted how consumer culture unsettled generational identities: ‘Blue jeans, the deliberately demotic wear pioneered on American college campuses by students who did *not* wish to look like their elders, came to appear, on weekdays and holidays, or even, in “creative” or other hip occupations at work, below many a grey head’ (326). Eric was not one of those grey heads.

in its own right. A partial exception is his treatment of the 1960s as a cultural revolution. As he put it in a characteristically controversial passage in *Interesting Times* (2002), the ‘year 1968 may prove to be less of a turning-point in twentieth-century history than 1965, which has no political significance whatever, but was the year in which the French clothing industry for the first time produced more women’s trousers than skirts’.⁶ It was in the 1970s and 1980s that a new generation of anthropologists and historians reclaimed consumption as a major source of social identity for class and gender. But giving attention to goods and their use need not mean shelving Hobsbawm’s main project and his interest in the history of capitalism. Quite the contrary: consuming not only creates identities, it also generates demand, which in turn propels capitalism, production, and social and material change. The pages to come should therefore be read as an extension of Hobsbawm’s intellectual architecture—a plea for making us think about ways to historicize demand and to understand how the lifestyles that generate it stimulate capitalism. Consumption, in other words, is an input of capitalism as well as an output.

Consuming is private and intimate, but also public and global. Getting a grip on it therefore raises interesting challenges about the scale of historical inquiry. Recent environmental historians have stretched the scale of this research to ‘deep history’, making it run across centuries and millennia.⁷ This chapter argues that we should also travel further between spatial scales (macro and micro, global and local), if we are to understand better the dynamic expansion of our material world. The following sections explore some of the chains

⁶ Eric Hobsbawm, *Interesting Times: A Twentieth-Century Life* (London, 2002), 261.

⁷ From the growing literature, see Julia Adeney Thomas, ‘History and Biology in the Anthropocene: Problems of Scale, Problems of Value’, *American Historical Review* 119.5 (2014), 1587–607; Andrew Shryock and Daniel Lord Smail, eds, *Deep History: The Architecture of Past and Present* (Berkeley, CA, 2011). See also the chapter by Paul Warde in this volume.

in these spatial connections, starting with trade and empire, then turning inward to the material self, before tracing connections between modern networks, energy use, and people's habits. I will conclude by reflecting on the methodological challenges that face historians of the material world.

Trade and Empire

One way to connect the local and the global is by tracing the life of a commodity. At their best, commodity biographies can illuminate the links between sites of production and consumption on opposite sides of the world. Sidney Mintz's pioneering account of sugar, *Sweetness and Power* (1985), is a towering example.⁸ Yet many such works have limitations not dissimilar to those of conventional biographies. There is a danger of methodological solipsism, as if everything in the world turned around the chosen commodity as the main protagonist in history. But, of course, the world is full of commodities and objects. Very few objects are, so to speak, their own masters. Tea, coffee, and cocoa in the Atlantic world, for example, and also maté in Latin America, were all part of larger cultures of sociability and comfort that involved many other objects and services, from drinking utensils and furniture to ideas about appropriate dress and behaviour. While commodities leave their mark on the organization of labour and leisure—the plantation and the tea party—they are also the products of larger historical forces. Commodity biographies tend to exaggerate the former

⁸ Sidney Mintz, *Sweetness and Power: The Place of Sugar in Modern History* (New York, 1985). For different approaches, see Robert J. Foster, 'Tracking Globalization: Commodities and Value in Motion', in Christopher Tilley, Webb Keane, Susanne Kühler, Mike Rowlands, and Patricia Spyer, eds, *Handbook of Material Culture* (London, 2006), 285–302. See also the chapter by Pat Hudson in this volume.

and to downplay the latter. To try and pin the rise of Protestant Northern Europe in the seventeenth and eighteenth centuries and the decline of the Catholic south onto their respective taste for coffee versus chocolate is not very illuminating.⁹ Commodities circulated through the veins of empires and trading networks in a larger body politics with its own ideas, interests, and institutions. And these larger structures underwent fundamental changes between 1500 and 1900 that, in turn, helped to transform the world of goods.

Goods had travelled between continents since ancient times. By AD 100 textiles, indigo, and spices reached the Roman empire from Asia via the Silk Road, coins, fine glass, and coral moving in return. By 1000 the Indian Ocean had become such a lively trading zone that it was common to see cottons dyed and printed in Gujarat in the markets of Cairo and Zanzibar.¹⁰ Inventories, diaries, and other gazettes reveal a growing number of chests, shirts, cutlery, oriental carpets, and musical instruments from Asia in Renaissance Italy in the fifteenth century, including in the homes of artisans.¹¹ Late Ming China enjoyed its own

⁹ Britons are renowned tea drinkers, but it tends to be forgotten that in 1900 they also drank as much chocolate as the Spanish. Nor should the sober atmosphere of the coffee house in earlier centuries be overdone; see Brian Cowan, *The Social Life of Coffee: The Emergence of the British Coffeehouse* (New Haven, CT, 2005).

¹⁰ Peter Frankopan, *The Silk Roads: A New History of the World* (London, 2015); Ruth Barnes, *Indian Block-Printed Textiles In Egypt: The Newberry Collection in the Ashmolean Museum* (Oxford, 1997).

¹¹ Isabella Palumbo-Fossati, 'L'interno della casa dell'artigiano e dell'artista nella Venezia del cinquecento', *Studi Veneziani* 8 (1984), 109–53; Marta Ajmar-Wollheim and Flora Dennis, eds, *At Home in Renaissance Italy* (London, 2006).

commercial heyday as more sugar, books, and porcelain circulated in the empire.¹² Still, goods also confronted many obstacles in these settings. Italian cities like Florence were essentially small, high-end artisanal markets for the European elite. Their fortune rose and fell with that of a fairly small, exclusive clientele. It was a highly vulnerable position. The discovery of the Americas in 1492 was part of a long-term shift in trade from the Mediterranean to the Atlantic and from Venice and Florence to Amsterdam and London. Then the Thirty Years' War (1618-48) cut the Italian cities off from markets in Northern Europe. Late Ming China, meanwhile, had commerce but few cities, and thus also few urban consumers. And, with the exception of the voyages to India in the early fifteenth century, the late Ming emperors were oriented inwards, not outwards. This territorial orientation had a cultural counterpart: what was primarily valued was domestic antiques, not novelties or exotic goods from afar. Like Renaissance Italy, late Ming China prized land over commerce. Consumption remained suspect, denounced for eroding social and gender hierarchies, for corrupting the soul, and for draining the coffers of cities and states.

By contrast, the European empires, first and foremost the Dutch and the British, carved out a new, more dynamic world of goods. Bits of the New World were carried across the world in the shape of mined silver and gold, being used as payment for porcelain and cotton from China and India. Imperial commanders and soldiers of fortune returned with loot from India and Egypt.¹³ The Caribbean became a major site of transplantation. Enslaved people

¹² Timothy Brook, *The Confusions of Pleasure: Commerce and Culture in Ming China* (Berkeley, CA, 1998).

¹³ Maya Jasanoff, *Edge of Empire: Lives, Culture, and Conquest in the East, 1750–1850* (New York, 2005).

and plants from one part of the world were uprooted and grafted onto another.¹⁴ Sugar and coffee plantations opened up new zones of cultivation. It is debatable whether this ecological annexation (together with coal fields at home) was decisive by giving Britain a head start in industrialization and by leading to the ‘great divergence’ between Northern Europe and China.¹⁵ What is indisputable is that imperial expansion played an important role in widening the range of goods and foods available to Europeans and their cousins overseas and, with that, people’s norms and expectations. In North America, it was the experience of a rising standard of living in the early and mid-eighteenth century that turned colonial consumers into revolutionary patriots in the 1760s and 1770s, when Westminster reverted to taxing the colonies.¹⁶ Mercantile tariffs and shipping restrictions certainly meant that prices were steeper and access more limited than in a free market, but it is difficult to see how these new zones of cotton, coffee, and sugar could have been brought into existence in the first place without the force of empire, the navy, and the slave trade.¹⁷

¹⁴ Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Cambridge, 1986).

¹⁵ Kenneth Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern World Economy* (Princeton, NJ, 2000); Prasannan Parthasarathi, *Why Europe Grew Rich and Asia Did Not: Global Economic Divergence, 1600–1850* (Cambridge, 2011); Stephen Broadberry and Bishnupriya Gupta, ‘The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500–1800’, *Economic History Review* 59.1 (2006), 2–31.

¹⁶ See T. H. Breen, *The Marketplace of Revolution: How Consumer Politics Shaped American Independence* (New York, 2004), and now Steve Pincus, *The Heart of the Declaration: The Founders’ Case for an Activist Government* (New Haven, CT, 2016).

¹⁷ Here as elsewhere, I am simplifying a very complex and long-standing debate. A good starting point is Patrick K. O’Brien, ‘Fiscal and Financial Preconditions for the Rise of British Naval

If the eighteenth century was marked by imperial rivalry and protectionism, the nineteenth brought British hegemony and free trade. In 1846 Britain repealed its protectionist corn laws, and shortly thereafter its restrictive navigation acts. The new open-door policy triggered a series of some fifty European trade treaties in the 1860s; in this it was a forerunner of the European single market in the 1970s. While Britain's European trading partners reverted to protectionism in the 1880s, Britain kept its door wide open. For the world of goods, this liberal opening was hugely consequential. Not only did consumers in Liverpool and London get more stuff at cheaper prices, but people in Vienna and Stockholm, too, began to enjoy the fruits of foreign colonies more easily. In fact, by 1914, Scandinavians were drinking more coffee per person than anyone else in the world, something inconceivable without the more liberal architecture of world trade.

Free trade, steamships, and cooling technology fostered a more integrated world economy than ever before. Price, not origin, was now decisive, and this changed the quantity and quality of things in circulation. By 1900, for example, Britons consumed 90 lb. of sugar per person, but most of this now came from beet in Germany and continental Europe, not from sugar cane on Jamaican plantations. As the material world bulged, then, there were also big shifts in material flows between regions. The crisis and decline of the British Caribbean after slavery and in the era of free trade was one part of this story.

The more 'liberal' circulation of goods changed the look of things as well and, with it, the creation of value. In the seventeenth century, coffee and cocoa had been prized for their distant, exotic qualities. They marked the tasteful consumption of travellers, scientists, and *virtuosi* connoisseurs. By the late nineteenth century, by contrast, they had become mass consumer goods and were increasingly repackaged as industrial foods. Their value now

Hegemony, 1485–815', EH Working Paper, 91/05, 2005

(<http://www.lse.ac.uk/economicHistory/pdf/WP9105.pdf>, accessed 19 May 2017).

derived not from their exotic origin but from European technology, standards, and marketing. The technique of extracting butter from the cocoa bean opened the door to chocolate bars and cocoa powder. When Europeans brewed their coffee in 1900, they now mostly drank a blend of beans from Brazil, Kenya, and Mysore.

Some writers have presented this period as launching a form of ‘commodity racism’.¹⁸ This is too simple. The reality was more surprising and more troubling. Instead of vilifying colonial ‘others’ openly, Europeans erased them altogether from the brands and advertisements of coffee, cocoa, and chocolate. Cadbury advertised its ‘authentic English cocoa’, manufactured to scientific standards in the healthy air of its Bournville factory. Coffee brands in imperial Germany included ‘Industrie’, which showed a proud German worker in front of smokestacks, not an indentured labourer on an exotic plantation, and ‘Arminius’, named after the German national hero who defeated the Romans in the Teutoburg Forest in AD 8.¹⁹ At the 1893 world fair in Chicago, Stollwerck created a 38-foot tall chocolate temple of Germania. The French had ‘Jeanne d’Arc’ chocolate bars, the Swiss had ‘Toblerone’ with a bear on the Matterhorn. In Finland, after the First World War, the Paulig company sent the so-called Paula Girls in folkloristic Sääksmäki costumes up and down the country to teach housewives how to brew proper ‘Finnish’ coffee. Exotic origins never entirely disappeared—rum is one example. Still, the domestication of previously exoticized products is striking. The era of mass consumption, then, must be thought together with free trade, the new imperialism, and the creation of national publics. In addition to

¹⁸ Anne McClintock, *Imperial Leather: Race, Gender and Sexuality in the Colonial Contest* (London, 1995).

¹⁹ Julia Laura Rischbieter, *Mikro-Ökonomie der Globalisierung: Kaffee, Kaufleute und Konsumenten im Kaiserreich 1870–1914* (Köln, 2011).

ransacking Africa, Asia, and Latin America for resources for European industry, Europeans also nationalized the image of many colonial things (see Plates 11.1a–d).

Materialization, then, is not straightforward, either culturally or economically. Nor is so the physical flow of materials between different regions of the world. The total volume of stuff circulating in the world increased eight times between 1962 and 2005—from 2,400 to 19,000 million tonnes; roughly half of that comes in the shape of fossil fuels; the rest is biomass, metals, and minerals. But the relative position of regions shifted in this period. In the 1960s, Europe, the United States, and Japan were the principal net importers of resources. By 2000 they had been joined by China, India, South Korea, and Malaysia, which now exceeded the demands of many European countries. The largest net exporter of resources is Australia; it is followed by Canada and Brazil, which exports growing amounts of biomass. So far these figures refer to actual physical exchanges between countries, for in stance in the form of shipping oil from Venezuela to China. The picture becomes more complex and gloomier if we recall the ‘ecological rucksack’ full of all the things and materials needed to produce the goods that countries purchase. Since the 1970s, Britain, for example, has seen a sharp decline in direct use of material, thanks to deindustrialization: fewer factories and plants translate into less demand for coal, iron and steel. But, on their own, national material accounts produce an optical illusion. They need to be placed in their true global, environmental context if we are to recognize the hidden resources that lie embedded in imported things produced elsewhere. A British person buying a car made in Brazil, for example, is responsible not only for the 2 tons of steel, glass, and plastic that end up rolling down a suburban street in Peckham. Manufacturing this vehicle required a lot of fossil fuel, iron, and various other resources in Brazil, Spain, and Poland. At least some of these materials should be laid at Britain’s door. Calculations of such indirect flows for the period 1962–2005 show that South America, Australia, and Central Asia have been increasingly

bearing the environmental burden for the rest of the world. Put differently, Western Europe and Japan—and, increasingly, also the United States and China—have been enjoying plenty of materials while offshoring most of the environmental damage involved in their production.²⁰

The legacies from such regional imbalances in material flows are not just a matter for ethical and ecological debate today. They also invite us to widen our perspective on past developments. The Victorian and Edwardian story of free trade, for example, to this day is overwhelmingly told as a liberal success story of market integration, of putting ‘a girdle around the earth’ as Victorian liberals liked to say, with cheaper food and benefits for all, and the occasional acknowledgement that it also involved imperial wars, famines, and force.²¹ But the quickening metabolism in the era of free trade also involved the unprecedented extraction and use of resources. And this had profound consequences for landscapes and environments, both within Britain itself and for the rest of the world. By 1900, some 80 per cent of the world’s coal trade was in British hands. At the end of the First World War, it was

²⁰ Monika Dittrich and Stefan Brinzeu, ‘The Physical Dimension of International Trade, Part 1:

Direct Global Flows between 1962 and 2005’, *Ecological Economics* 69.9 (2010), 1838–47;

Monika Dittrich, Stefan Brinzeu, and Helmut Schutz, ‘The Physical Dimension of International Trade, Part 2: Indirect Global Resource Flows between 1962 and 2005’, *Ecological Economics* 79 (2012), 32–43.

²¹ The Whiggish narrative persists in spite of recent and older critical accounts: John Gallagher and Ronald Robinson, ‘The Imperialism of Free Trade’, *Economic History Review* 6.1 (1953), 1–15; Anthony Howe, *Free Trade and Liberal England 1846–1946* (Oxford, 1997); Mike Davis, *Late Victorian Holocausts: El Nino Famines and the Making of the Third World* (London, 2001); Frank Trentmann, *Free Trade Nation: Commerce, Consumption, and Civil Society in Modern Britain* (Oxford, 2008).

estimated that Britain pumped 10 million tons of smoke and soot into the air.²² The long-distance trade in bulk foodstuffs had already been a feature of the early modern world. In the eighteenth century, the Dutch shipped herring from the North Sea to Northern Europe and to the German states; in exchange, grain from Prussia, Poland, and Bohemia moved west. By the early 1830s, wheat and flour had travelled over 2,000 miles before they reached breakfast tables in London. Free trade (after 1846), steamboats, and refrigeration stretched food even further, and now also more perishable items. In the eighteenth century a Londoner's butter, cheese, and eggs used to come from a few hundred miles away. By the 1870s, they had travelled over 1,300 miles.²³ Before 1846 fruit and vegetables and live animals had been sourced locally or regionally. By the 1890s, these, too, had travelled over 1,000 and 3,000 miles respectively. Under free trade, Britons not only developed a bigger appetite: their appetite also left its legacy on ever more distant parts of the world.

Free trade and laissez-faire did not win out everywhere—in colonial India, for example, concerns over the conservation of native forests made colonial administrators look to government and regulation.²⁴ But the revolution in transport, mobility, and communication in these decades unquestionably reinforced the pull on overseas resources. The transatlantic cable that connected Valentia Island in the west of Ireland with Heart's Content in eastern

²² Chris Otter, 'Liberty and Ecology: Resources, Markets, and the British Contribution to the Global Environmental Crisis', in Simon Gunn and James Vernon, eds, *The Peculiarities of Liberal Modernity in Imperial Britain* (Berkeley, CA, 2011), 182–98.

²³ J. Richard Peet, 'The Spatial Expansion of Commercial Agriculture in the Nineteenth Century', *Economic Geography* 45 (1969), 283–301.

²⁴ See Emma G. Reisz, "'Provident" Political Economy in Indian Forests', in Martin Daunton and Frank Trentmann, eds, *Worlds of Political Economy: Knowledge and Power in the Nineteenth and Twentieth Centuries* (Basingstoke and New York, 2004), 115–35.

Newfoundland in 1866 required copper for 340,000 miles of wire, which were coated with gutta-percha, a natural rubber from Borneo. The cable did not only speed up communication, it also involved the annual destruction of 26 million trees in Borneo. By the 1880s, western experts warned of how the ‘gradual scarcity, and threatened extinction of the guttifiers, has for some years been the cause of much anxiety’ and threatened the future of the electrical industries.²⁵

Historical studies of consumption and research on resources tend to be separate fields. The former chart the rise of affluence, leaving scarcity to the latter. The dominant narrative of ‘consumer society’ is thus a story of more and more, in which shortages and environmental consequences appear, if at all, as an effect or afterword, most notably since the oil crises of the 1970s. Bringing consumption and the flow of materials into the same analytical frame creates the opportunity to tell a radically different story. It enables us to view affluence and scarcity in a dialectical relationship, in constant interplay. Rising demand and diminishing resources are the see-saw of modern capitalism.

Scarcity long predates the environmental concerns and ‘postmaterialist’ values of the 1970s. More coal burning in domestic fires and industrial furnaces led Victorians to worry about a ‘coal famine’.²⁶ In 1908 US President Roosevelt set up a National Conservation Commission, because it was feared that the United States was burning through its own resources so fast that the country was at risk of decline and exhaustion. In 1951 Truman followed with the President’s Materials Policy Commission, in order to show that America

²⁵ Charles Bright, *Submarine Telegraphs: Their History, Construction, and Working* (London, 1898; repr. Cambridge, 2014). The quotation comes from page 258, which also gives calculations about the destruction of trees.

²⁶ There is a forthcoming study on coal by Fredrik Albritton Jonsson, *Cornucopia and the Stationary Future: The End of Growth in the Age of Industry*.

still had the ability to grow. The warning that the world was reaching the ‘limit of growth’, often associated with the Club of Rome’s report published in 1972, was already made by the American conservationist Samuel Ordway in 1955, in the very midst of the postwar boom.²⁷

What changed in the modern period were the remedies offered to the problem. And these reflect the governing ideologies of their day. During the progressive era, in the early twentieth century, responsible stewardship was in the moral purview of all citizens. By the 1950s, in the era of the Cold War, thinking about future resources had become inseparable from a defence of freedom, choice, and the market. Truman’s commissioners noted with concern the ‘lavish use of materials’—richly ornamented cars with single passengers who enjoyed the roar and acceleration of heavy engines—but to interfere with rising consumption and private lifestyle was now off the political table. Private enterprise, individual choice, and growth would guide the use of energy and resources, with a minimum of government guidance.

Shortages, moreover, were not only about the absence of things at that particular moment. Efforts to persuade people to conserve resources now often came with promises of a brighter future, in which goods and comforts would return as a reward for temporary sacrifice. Thus, in the late 1940s, amid an energy crisis, Germans were urged to conserve electricity, switch off their heaters and appliances, and monitor their meters daily, while

²⁷ Samuel Ordway, ‘Possible Limits of Raw Material Consumption’, in William L. Thomas, ed., *Man’s Role in Changing the Face of the Earth* (Chicago, 1956), 987-1009.; Donella Meadows, Dennis L. Meadows, Jorgen Randers, and William W. Behrens III, *The Limits to Growth: A Report for the Club of Rome’s Project on the Predicament of Mankind* (New York, 1972). See also Libby Robin, Sverker Sorlin, and Paul Warde, *The Future of Nature: Documents of Global Change* (New Haven, CT, 2013), esp. Part 2.

posters announced the impending return of electrical helpers. In this way shortages also created expectations of plenty (see Plate 11.2).

The Material Self

Trade flows of fossil fuels, biomass, and minerals, measured in billions of tons, give a valuable sense of the changing scale of the material world and of the problems arising from it. But they can also appear abstract and lifeless and do not explain *why* people and societies came to pursue and devour so much more stuff over time. This is not the place to discuss all the various factors behind the growth of consumption—factors that, in addition to empire, would need to include purchasing power, urbanization, innovation, and the rise of a middle-class culture.²⁸ Instead I would like to turn now to one critical dimension: people's changing view of things and, by extension, of themselves. The expansion of the material world involved a fundamental sea change. Everyone, from Plato to the Christian fathers, had preached that humans and things were fundamental opposites, the mind or soul being in need of protection from the corrupting lure of objects. Between the seventeenth and the nineteenth centuries a new mindset was gaining ground that appreciated things as essential elements of what it meant to be human. Without an appreciation of this rapprochement between humans and things, it is impossible to understand the dynamic growth of the world of things. For more and more stuff to enter people's lives, things had to enter their hearts and minds.

²⁸ Frank Trentmann, ed., *The Oxford Handbook of the History of Consumption* (Oxford, 2012); Frank Trentmann, *Empire of Things: How We Became a World of Consumers, from the Fifteenth Century to the Twenty-First* (London, 2016). ????? [not given so far: plse complete this entry(including the title –which probably has article?)].

Our understanding of this transformation has suffered from two distorted perspectives, which have portrayed modernity as a socioeconomic system that separated humans from things. The first is Marxism. Here the rise of capitalism in the West is linked to the triumph of money and markets. Wage labour alienated workers from the products of their own hands. Whereas older cultures fetishized goods for their supernatural or animalistic powers, products in capitalist societies were given a price tag, which turned them into an abstract unit that could be exchanged for money. The capitalist market economy conjured up an unnatural equivalence between all sorts of different products: 20 yards of linen = 1 coat = 10 lb. of tea = 1 quarter of corn = $\frac{1}{2}$ ton of iron, to use Marx's own example in the first volume of *Capital*.²⁹ The materialist conception of history carried its name for a reason. Marx's followers were convinced that only socialism truly appreciated matter as the foundation of nature and society.³⁰ Capitalism might throw up shiny products, but deep down it did not care about stuff and naturally led to a squandering of resources. In reality, of course, socialist countries turned out to be even more wasteful and polluting than their capitalist neighbours.

The second perspective comes from a more recent socio-technological view of the modern world, which was championed by the French sociologist and thinker Bruno Latour and attracted an influential international following in the social sciences in the 1990s and in the first decade of the twenty-first century. Latour reacted against the indifference to things then dominant in the social sciences, where states, social movements, and human actors did all the running. At a time of growing concern about climate change and the escalation of material use, this disregard for things was profoundly problematic, politically as well as scientifically. In his early work in the 1970s and 1980s, Latour had shown how in real life science did not advance through rational principles but was a social construct, shaped by

²⁹ See Karl Marx, *Das Kapital* (Frankfurt, 1987 [1867]), 43 (Book I, ch. 1).

³⁰ See John Bellamy Foster, *Marx's Ecology: Materialism and Nature* (New York, 1999).

interactions in a laboratory between scientists, their ideas, and, critically, their instruments.³¹ More generally, he argued, a lot of what people did and of how society functioned was only made possible by material ‘actants’, from keys and doors that opened and shut spaces to tools and machinery that enabled people to express themselves and put virtual ideas into physical reality. Pistols, bullets, fridges, and plastics do matter. This rallying call for the ‘missing masses’ retains a lot of its original force.³² In subsequent work, however, Latour went a big step further and imposed his critique of the contemporary silencing of things onto modernity as a whole. In this view, like in Marx’s, modernity was founded on a widening gulf between humans and things. But here, unlike in Marxism, it was reason (not markets and capital) that advanced the illusory idea of a civilization and progress propelled by the human mind alone. A direct line ran from Hobbes, Rousseau, and Kant in the seventeenth and eighteenth century to Rawls and Habermas in the twentieth. A clean break with this reason-based modernity was necessary in order to give things back their agency and get them heard: Latour aptly called for *Dingpolitik*.³³

³¹ Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (London, 1979); Bruno Latour, *The Pasteurization of France* (Cambridge, MA, 1988).

³² Bruno Latour, ‘Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts’, in Wiebe E. Bijker and John Law, eds, *Shaping Technology/Building Society* (Cambridge, MA, 1992), 225–58; Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford, 2005).

³³ Bruno Latour, ‘From Realpolitik to Dingpolitik’, in Bruno Latour and Peter Weibel, eds, *Making Things Public: Atmospheres of Democracy* (Cambridge MA, 2005). The split between mind and body is often associated with Descartes, but recent philosophers have pointed out that Descartes, too, had a much richer view of the self; see Karen Detlefsen, ed., *Descartes’ Meditations: A Critical Guide* (Cambridge, 2013).

Alongside an emphasis on critical reason, however, modernity in fact gave rise to a new appreciation of things. Critics who warned against luxury and the power of things to corrupt the mind did not disappear, but they were confronted and outflanked by a growing number of voices who defended and embraced objects and possessions as sources of human identity, social advancement, and economic progress. These ideas came in several forms. One was a religious argument. God had furnished people with multiple and insatiable desires, wrote Robert Boyle, the great seventeenth-century Anglo-Irish scientist who is remembered today for his experiments with the air pump. He wanted people to be inquisitive and industrious. In seeking to satisfy their own desires, people were therefore not straying from a divinely ordained path, let alone selling their soul to the devil. Quite the contrary, Boyle wrote, it led them to a ‘more exquisite admiration of the omniscient Author’.³⁴ Things could be friends of the spirit, not just their enemies.

A related argument connected the desire for novelty to the pursuit of trade and exploration. In the 1630s, Caspar Barlaeus, the Dutch polymath, praised trade for making people appreciate new things.³⁵ The world was full of undiscovered goods and objects, Thomas Sprat, one of the founders of the Royal Society in England, wrote three decades later. Why else would God had put them in the world, if He did not want humans to find them and use them? New fibres and new objects such as optical glass were vehicles of progress that

³⁴ Robert Boyle, *Some Considerations Touching the Usefulness of Experimental Natural Philosophy* [1663], in idem, *Works of the Honourable Robert Boyle* (London, 1772), vol. 2, 5-63[plse supply full page range], here 31.

³⁵ Harold J. Cook, *Matters of Exchange: Commerce, Medicine, and Science in the Dutch Golden Age* (New Haven CT, 2007).

opened up the universe in all its divine splendour.³⁶ In the mid-eighteenth century, the Scottish enlightenment thinker David Hume refined these ideas into a general secular defence of moderate luxuries as a source of national wealth and cultural progress. New fashions and comforts made people more creative, productive, and civilized, which in turn made countries stronger as well as richer.

Here was the mental furniture not only for traders and improvers but also for people at large. It was this new orientation towards the material world that made many flock in the seventeenth century to cabinet of curiosities and *Wunderkammern*, to admire everything from automatic clocks and exotic plants to the tusk of a narwhal. The idea that God had wanted people to discover and enjoy beautiful things also left its mark on a central stage of consumption: the home. Domestic possessions and the domestic interior came to demonstrate the spiritual development of their owners. Puritan austerity was out, a celebration of divine beauty was in. In Britain, one Baptist minister preached in the 1860s: ‘We have left the old Puritan error. We no longer despise the beautiful and artistic, but claim them as divine things, and enlist them in divine service ... all man’s life and work can be dedicated to heaven.’³⁷

In the context of Victorian Britain, these new attitudes have been traced to the rising doctrine of incarnationism and the decline of a more tortured evangelicalism, which had been fixated on sin and atonement. But the greater friendliness towards things gained a larger international momentum and advanced across a surprising number of Protestant doctrines and denominations, from the reformed church in Switzerland to the Mormon tabernacle in Salt Lake City. Among Mormons, letters and diaries in the 1860s–1880s give testimony to the

³⁶ Thomas Sprat, *History of the Royal Society of London, for the Improving of Natural Knowledge* (London, 1667); Sprat became the bishop of Rochester.

³⁷ E. Luscombe Hull, quoted in Deborah Cohen, *Household Gods: The British and their Possessions* (New Haven, CT, 2006), 26.

growing importance attached to cultivating one's personal taste through beautiful objects.³⁸

Possessions refined the person through a higher symbiosis of aesthetics and spirituality.

In the years around 1900, the material turn was discernible across western thought and culture, from psychology and literature to early anthropology and the display of indigenous and 'traditional' lifestyles at exhibitions and museums. In the *Principles of Psychology* (1890), William James noted the significance of objects for emotions and identity. People had not only a 'social self' and a 'spiritual self', they also had a 'material self'. 'The body', he wrote, 'is the innermost part of the material Self in each of us'. 'The clothes come next' and were a central source of personal identity. Then—and only then, in James' account—came our immediate family, 'bone of our bone and flesh of our flesh. When they die, a part of our very selves is gone.' People identified with their home: 'its aspects awaken the tenderest feelings of affection'. Homes were projects for improvement and sites for collecting more objects. Losing possessions, James wrote, did not only depress people because of a 'feeling that we must now go without certain goods that we expected the possessions to bring in their train'. It also involved 'a sense of the shrinkage of our personality, a partial conversion of ourselves to nothingness'.³⁹

Contemporary writers and novelists, including Williams James' own younger brother Henry, explored how objects created meaning and helped build and destroy relationships between people.⁴⁰ During the First World War the artist Marcel Duchamp retrieved a bicycle wheel and a urinal and exhibited them as pieces of art. Such 'ready-mades' may have attracted few admirers at the time, but fascination with objects was widespread, especially as

³⁸ Greg ('Fritz') Umbach, 'Learning to Shop in Zion: The Consumer Revolution in Great Basin Mormon Culture, 1847–1910', *Journal of Social History* 38 (2004), 29–61.

³⁹ William James, *Principles of Psychology* (New York, 1918 [1890]), vol. 1, 292–3.

⁴⁰ Bill Brown, *A Sense of Things: The Object Matter of American Literature* (Chicago, IL, 2003).

old objects were falling into disuse. In London, Paris, and New York this was a golden age for second-hand and antique stores and those producing historical lookalike furniture.⁴¹ As it churned out a lot of cheap new stuff, mass manufacturing also triggered a demand for old or authentic-looking vintage goods. Collecting expanded into a popular pastime. At a time of rapid social and technological change, everyday objects appeared to hold out a spiritual as much as a physical lifeline to the past. ‘Ordinary’ things acquired extraordinary value.

What role did this growing cultural sense of things play in the larger material history of the world? A recognition of the flux between humans and the material world was hardly unique to Europeans and Americans at the time. In Asian religions, things can have a soul. In Buddhism, they can strive towards liberation. Asian cultures were (and arguably remain) far less suspicious of objects and wealth than European ones, but that did not give them a head start in the consumer revolution or in the Industrial Revolution; nor, I should add, have fetishistic elements prevented them from exploiting markets and rapid development in recent decades. In other words, we must guard against monocausal explanations in which culture is treated as a simple economic asset. At the same time, the parallel expansion of things in trade and mentality deserves emphasis. The growing sensibility and receptiveness towards things gave objects greater room for physical circulation than they previously had. Restraints on demand never entirely disappeared; but they certainly loosened.⁴² The appreciation that people had a ‘material self’ gave possessions a new legitimacy, as tools of self-cultivation and social advancement. This insight did not automatically favour liberal solutions.

⁴¹ Manuel Charpy, ‘Le théâtre des objets: Espaces privés, culture matérielle et identité bourgeoise, Paris 1830–1914’, unpublished PhD dissertation, Université François-Rabelais de Tours, 2010.

⁴² For a discussion of how sumptuary laws repressed demand and especially punished women, see Sheilagh C. Ogilvie, *A Bitter Living: Women, Markets, and Social Capital in Early Modern Germany* (Oxford, 2003).

Totalitarian regimes, too, tried to exploit it for their ends. The campaign for *kulturnost* (a cultured lifestyle) in Stalin's Russia looked to the mirror, soap, and clean shirts to turn peasants into socialists. Political regimes differed in their methods, but across the board there was a growing tendency to see objects as a critical marker of personal and national identity. It is difficult to understand the material expansion of the modern world without these widening cultural horizons.

Demanding Infrastructures, Demanding Lifestyles

So far, I have stressed the physical and cultural materialization of the modern world. These two processes worked in tandem. Networked infrastructures—such as those of gas, water, and electricity—brought material flows, social norms, and practices into immediate and intensive interplay. In the course of the nineteenth and twentieth centuries these centralized networks and grids advanced into models of development. It is only in the last few decades that they have, once again, been challenged by calls for greater local self-reliance, off-grid, renewable solutions, or smart minigrids in which consumers are also producers of energy, so-called 'prosumers'.

Networks fundamentally altered the relationship between what people do, the appliances or machines they employ to accomplish their tasks, and their contact with the resources they need. Consider a typical household in a European city in 1900, which is dependent on a coal fire for heating, cooking, and washing. The household had to have the coal delivered, but, once that was accomplished, it could go about its domestic duties whenever it chose, regardless of what the neighbours did or when. The coal fire was physically prepared in the late evening for the following morning, mostly by older children—that is, as long as there was enough coal in the house. Most working-class tenements lacked a storage place and

scraped by with small (and overpriced) deliveries, week after week. At a time of crisis, like the First World War, this meant irregular deliveries and little heat, or sometimes none at all. As a British government inquiry at the time showed, the coal crisis in London and southern England was one of distribution rather than supply: the railroads were congested by trains with troops and ammunitions.⁴³

Electricity grids introduced very different relationships from the 1920s onwards. Alternating current electricity cannot be stored at home. It required a flick of the switch and no advance preparation or particular care to keep it going. Networks were much more efficient in balancing supply with demand by pooling power and distributing it where and when it was needed. On the other hand, by connecting many different users, the network also created new temporal vulnerabilities: peak demand. If every household switched on its electric heater or kettle at the same hour, it would create such a surge that it could bring down the entire system. Unlike the personalized, free-standing power plant of the individual fire, the electric grid needs to be able to have enough extra capacity (peaking stations, backup generators, and pumped storage reservoirs) for multiple users to switch on appliances just at the same moment. On the demand side just as on the supply side, coal and electricity therefore involve fundamentally different material relationships.

The era of networks came with phenomenal changes in consumption. In Europe, the total energy consumption per person doubled between 1930 and 2000. Electricity alone increased

⁴³ *Report of the Committee Appointed by the Board of Trade to Inquire into the Causes of the Present Rise in the Retail Price of Coal Sold for Domestic Use*, Parliamentary Papers 1914–1916, Cd. 7923. See also Armin Triebel, ‘Coal and the Metropolis’, in Jay Winter and Jean-Louis Robert, eds, *Capital Cities at War: Paris, London, Berlin 1914–1919* (Cambridge, 1997), 342–73.

twenty times per capita.⁴⁴ In the United Kingdom, in 1974, households were responsible for 43 per cent of the total electricity demand—the bulk was for heating space and water. Thirty years earlier, that amount had been just 7 per cent. How and why did demand grow so quickly? We know a fair bit about the individual pieces of this puzzle. In industrial societies, the postwar years saw unprecedented growth, an extension of the grid, and more power plants.⁴⁵ These are the same years when more washing machines, fridges, and TV sets were sold.⁴⁶ What we do not currently understand very well is how these pieces fit together. Put differently, what drives demand? Again, it is helpful to put consumption and material resources in the same frame of analysis. In this case, we need to think about the relationship between people's practices, such as cooking, washing, and heating, the appliances enabling these practices, and the networks providing the necessary power. How do infrastructures and daily practices relate to each other?

From the perspective of the engineer and economist, the answer is fairly straightforward. Networks make power readily available. Once power reaches households through cables, people use it to switch on the lights, bake bread, or heat the house. This is helpful, but only up to a point. Infrastructures and power plants are enormous and expensive projects—Hinkley Point C, the new nuclear power station planned for Britain, is scheduled to cost £18 billion, the equivalent of 50 per cent of what the government spends on housing and the environment in a whole year. To be viable, such long-term projects must not merely meet but

⁴⁴ See Astrid Kander, Paolo Malanima, and Paul Warde, *Power to the People: Energy in Europe over the Last Five Centuries* (Princeton NJ, 2013), 5 (figure 1.1), and 267 (table 8.3).

⁴⁵ See the seminal account by Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Baltimore, MD, 1983).

⁴⁶ Avner Offer and Sue Bowden, 'Household Appliances and the Use of Time: The United States and Britain since the 1920s', *Economic History Review* 47.4 (1994), 725–48.

anticipate and generate future demand. But this supply-oriented perspective only gets us so far. In the final analysis, networks depend just as much on the needs of various users; and, for households, this means the daily practices that are energy-hungry.⁴⁷ Ultimately it is heating, cooking, and taking a hot shower or bath that create the demand for electricity or gas that infrastructures try to meet. And these practices have a life of their own, which is at least as much a product of social norms and cultural changes as of supply and technology. Take the transformation of personal hygiene, which has made heating hot water for baths and showers a major source of energy demand. The late nineteenth century saw the growing popularity of a weekly bath in well-off middle-class families in English and American cities. From the 1960s to the 1980s the daily shower became the norm in the western world. Since 2000, the younger generation has started to move on to two or three daily showers, to the concern of public health officials who warn of the risk of allergies and skin diseases from ‘overbathing’.⁴⁸ This development has more to do with changing notions of cleanliness, fitness, and beauty and associated exercise and grooming regimes than with infrastructures as such. A similar example is the growing frequency with which individual items of clothing are put in the washing machine. Consuming needs hardware—the shower, the pipes, the cables, and the washing machine. In the end, though, it is shaped by how (and how frequently)

⁴⁷ For this interplay, see Elizabeth Shove, Frank Trentmann, and Matt Watson, eds, *Infrastructures in Practice: The Evolution of Demand in Networked Societies* (in press).

⁴⁸ See the article ‘Do You Shower Every Day? Science Says ...’, in the 8 June 2016 issue of the *Health Science Journal* (<http://www.thehealthsciencejournal.com/shower-every-day-science-says>, accessed on 29 August 2016). See also Elizabeth Shove, *Comfort, Cleanliness and Convenience: The Social Organisation of Normality* (Oxford, 2003). Among historians, there has been less sustained attention to ‘ordinary’ consumption. A rare exception is Daniel Roche, *A History of Everyday Things: The Birth of Consumption in France, 1600–1800* (Cambridge, 2000 [1997]).

people use that hardware. To understand these processes, we need social history and sociological attention to the evolution of practices.

Infrastructures and practices rarely fitted together smoothly in modern societies. Today's talk of 'energy transition' conjures up a shift from one resource era (fossil fuels) to another (renewables). But, as with the original 'Industrial Revolution', energy changes are not sudden. Societies were caught in processes of transformation throughout the modern era. They mixed different fuels and appliances. As late as 1949, 42 per cent of British households used coal to heat the water for their laundry in the summer (43 per cent used gas, 15 per cent electricity); in the winter the proportion climbed to 53 per cent, as many households relied on the coal fire as their primary source of heat.⁴⁹ Coexistence and combination of fuel types remain widespread in rich societies, as evidenced by the staying power of kerosene in Japan. In West Germany in the early 1980s, 46 per cent of households switched on an electric heater in spring and autumn, regardless of whether their primary heating was with petroleum, gas, or coal.⁵⁰

Such coexistence also points to the slow speed and selective adoption of new networks and technologies and to the resistance they faced. In Europe, electricity in homes was almost exclusively used for lighting in the interwar years, in spite of massive spectacles, showrooms, and promotions by utility companies that celebrated electricity as clean, easy, and modern. Outside a few corners of America, the 'all-electric home' remained an ideal, not a reality. Other fuels faced similar obstacles. Supply did not automatically create demand. In the 1930s, for example, the private Gas Light and Coke Company was pressing the London

⁴⁹ Leslie T. Wilkins, *Social Survey: Domestic Utilization of Heating Appliances and Expenditures on Fuels in 1948/49* (London, 1951).

⁵⁰ Vattenfall, Berlin, BEWAG Archiv: BEWAG 'Haushaltskundenbefragung 1981' durch die BEWAG Anwendungstechnik-Energieberatung, pp. 20–31.

County Council (LCC)—the largest provider of municipal housing in Britain—to expand gas appliances and to roll out smokeless gas-lit coke fires across its estates. But the LCC was cautious about how much unsatisfied demand for gas and coke its working-class tenants had. Almost all were used to a coal fire. An experimental trial in a couple of blocks produced a wide spectrum of reactions. Some felt that the smokeless fires were ‘very comfortable’, others did ‘not like it’ at all. Many did not use the gas to light the fire, as intended, but resorted to wood or paper instead. Some placed coal on the fire instead of coke. Yet others were used to seeing with their own eyes when the fuel was alight and kept the gas to ignite the coke burning for so long that it made the whole fire prohibitively expensive.⁵¹

This does not mean that societies were static. Town gas, electricity, kerosene, and, from the 1960s, natural gas did advance. But their use was uneven and related to changing lifestyles, sense of comfort, and use of space at home. In England in the 1940s, for example, household coal was limited and several million homes bought portable electrical or gas heaters. In war-torn Germany, where many families were quartered in other people’s flats, a small electrical hotplate offered a little piece of privacy, reducing conflict over access to the shared kitchen. Portable heaters provided ‘part-time space heating’, a critical step in the diffusion of thermal comfort into bedrooms and other spaces in the home that had previously led a cold existence. Bedrooms became spaces to study or to hang out with friends, not just to sleep in at night. Instead of most family life taking place around the hearth, social practices branched out into other parts of the home. It was this spatial diffusion of heat and practices that paved the way for central heating, not the other way around.

⁵¹ London Metropolitan Archive, LMA, GLC/HG/HHM/10/L055 Part 1, Survey Responses and Analysis by Officers, Spring 1936; Report by Surveyor, 14 May 1936, and tenant responses, 3 February 1938.

Infrastructural changes to the built environment, in short, changed the capacities for consumption, but their actual use depended on lifestyles, habits, and the socioeconomic conditions of their inhabitants. By retrieving the diverse experiences of people who lived through such transitions, historians can illuminate the processes of change. Take, for example, changes in heating in England in the 1960s. In the early 1960s, the LCC introduced new centrally provided underfloor heating in several blocks of flats. By 1963, the buildings were showing unexpected physical problems that baffled the engineers and town planners, who had put their faith in the technical superiority of the new heating system. The resultant survey gave a snapshot of how tenants actually lived. Usage varied hugely. In fact several tenants were not using their underfloor heating at all. Some had given up after a few trials because they felt they were only heating the neighbour's flat below, which did not use it either. Of those tenants who did use it, many complained that it was not warm enough, or not the right kind of heat. There were many reasons for the wide range of responses. Some had to with money—people on an instalment plan were more like to switch on their underfloor heating than those paying directly. But age and custom were just as important. Many of the older tenants had been used to heat with solid fuel (coal or coke) before moving into a modern flat. To them, a proper fire was what was 'normal'. It had flames, colour, smoke, and smell as well as thermal heat measured in Fahrenheit. Many contemporaries commented on the 'cheerfulness' and 'psychological tonic' of the open fire, which it them popular in spite of its inefficiency—a place that would be filled by the TV set in the course of the 1960s.⁵²

What is considered 'normal' use, of course, is not entirely up to the individual. It is the result of social conventions, norms, and standards. Buildings, pipes, wires, and lighting

⁵² Rupert Francis Brooks Grundy, 'The Economics of a District Heating System for 500 Houses at Harrow', *Journal of the Institution of Municipal Engineers* 71.12 (1945), 393-412 [year + full page range, plse?], here 393 and 411.

materialize those standards. A home or an office comes with a certain material endowment, an existing number of sockets, light bulbs, and boilers. How these standards evolve is poorly understood at present and deserves much greater research. Their development was certainly not a foregone conclusion. It involved an ongoing struggle between urban planners, the utility providers, architects, the building sector, government, and tenants. Electrical wiring in new homes in California was often so dodgy in the 1930s that Southern California Edison ran a public campaign against ‘bad’ wiring.

In general, raising standards took a lot of effort and had to overcome a lot of resistance. The road to our own materially intensive lifestyle has been littered with obstacles and failures. A single-minded concern with eventual outcomes tends to forget that. At the end of the Second World War, it was far from clear whether higher standards for all were either feasible or desirable. In Britain there was a fundamental debate about raising heating standards in the new homes ‘fit for heroes’ that were being planned. Was it the right social democratic thing to provide everyone, poor and rich, with cozy warm air, all day and all year round? Or, as the critics held, was this a dangerous kind of paternalism that would force working-class families to spend much more money on fuel than they otherwise would and that ignored the fact that most workers were accustomed to quite different temperatures? In the 1950s–1960s it was common for the poor to spend around 12 per cent of their total expenditure on fuel and light.⁵³ Perhaps it was wiser to prioritize exporting coal to other nations and earn much needed hard currency?⁵⁴ Official standards for space, flushing toilets,

⁵³ Ministry of Labour, *Family Expenditure Survey: Report for 1957–59* (London, 1961); Ministry of Labour, *Family Expenditure Survey: Report for 1963* (London, 1963).

⁵⁴ (Egerton) Heating and Ventillation Committee, Building Research Board, 1945; C. A. Masterman to A. C. G. Egerton, 1 March 1945, in Churchill Archives Centre (Cambridge), Harold Hartley Papers, Box 116.

and heating systems that would warm living and dining spaces to at least 18°C when the outside temperature dropped below freezing were only introduced in the United Kingdom in 1961, after the Parker Morris report, and revised in 1967; their mandatory nature was, significantly, abolished in 1980 by the conservative Thatcher government keen on cutting costs. In West Germany in the early 1960s, in the middle of the boom, housewives despaired about the so-called ‘socket bottleneck’. Forty-one per cent of kitchens only had one socket, and almost as many were smaller than 8 m². Housewives wanted more sockets and space; manufacturers wanted to sell more fridges, toasters, and electric mixers. It did not matter. When the space standard came up for renewal in 1965/6—new kitchens only needed to be 5.8 m²—they were sidelined by the building industry and urban planners, who put quantity of new homes above quality.⁵⁵

We have become so accustomed to higher standards and find it so difficult to imagine lifestyle change today that it is critical for historians to retrieve such earlier moments and to remind us just how recent even the idea of universal standards for all is, even in the most advanced societies, where ‘energy poverty’ and uneven provision across class and regions remain a reality.

Following the interplay between material infrastructures and people’s daily lives brings us back to a consideration of habits. We have seen that a lot of the use of materials and objects cannot be understood in terms of individual choice. Cooking, heating, bathing, watching television, and indeed shopping involve repetitive sequences of actions. But how exactly do habits emerge, evolve, and (sometimes) die? One approach to habits comes from

⁵⁵ Sophie Gerber, *Küche, Kühlschrank, Kilowatt: Zur Geschichte des privaten Energiekonsums in Deutschland, 1945–1990* (Bielefeld, 2015), 174–83. See also Frank Trentmann, *Materielle Kultur und Energiekonsum: Verbraucher und ihre Rolle für eine nachhaltige Entwicklung* (Munich, 2016).

microeconomics. In the 1960s the Nobel prizewinner Gary Becker studied how and why households shifted time and money from home production (cooking, cleaning, making clothes) to consumption (buying ready meals and clothes, hiring a cleaner, etc.), or vice versa. Consumer demand here emerged as a physical outcome, not as an expression of psychological desire. It was mediated by household technology. Behaviour was the result of fairly stable desires hitting a set of constraints.⁵⁶ But what if some habits also acquire a life of their own, promoting a set of social practices that then create expectations and produce constraints? The sociologist Elizabeth Shove argues that habits acquire people, not the other way around, as the familiar saying has it. From this perspective, habits are social practices that compete with one another and in the process ‘recruit’ individual ‘practitioners’ who develop the competence necessary to perform them.⁵⁷ Routinized actions, such as daily showering or going to the gym, are not, then, simply outputs of desires and constraints. Quite the opposite, they help to shape them. And they have knock-on effects on time, mobility, and resource use. They can change physical constraints—one bathroom for each bedroom provides a different setting for daily life from that of an arrangement with no bathroom and a portable tin tub; the habit of using digital devices 24/7 is creating new demands and expectations for utility and digital communication providers, batteries, and storage devices and their accessibility on trains, planes, and in many other places. The study of habits presents

⁵⁶ Gary S. Becker, ‘A Theory of the Allocation of Time’, *Economic Journal* 75.299 (1965), 493–517.

See also Kevin M. Murphy, ‘Gary Becker as Teacher’, *American Economic Review* 105.5 (2015), 71–3.

⁵⁷ See Elizabeth Shove, ‘Habits and Their Creatures’, in Alan Warde and Dale Southerton, eds, *The Habits of Consumption* (Helsinki, 2012), 100–12; Elizabeth Shove, Mika Pantzar, and Matthew Watson, *The Dynamics of Social Practice: Everyday Life and How It Changes* (London, 2012).

a fertile field with plenty of opportunities for future historians interested in engaging with the recent rediscovery of habits in the social sciences.

Things Matter ... but Some Matter More than Others

When historical studies of consumption took off in the 1980s and 1990s, they focused on shopping and possessions and their role in providing meaning and identity. These are and remain important topics. But, as we have seen in the previous pages, consuming reaches well beyond representations and the point of purchase. It is linked to political power as well as to markets. And it involves social habits, norms, and conventions, not just individual choice and preferences. Climate change has made it urgent for historians to inquire into the full story of humans' relationship with things, from desire and acquisition through to disposal. Such broader material histories can no longer stop with a physical object—be it decorated curtains or a fashionable coat—but need to extend to the many materials and resources that service and maintain our increasingly intensive lifestyle. Attention to the work done by things as well as to their meanings thus widens the cast of characters for material history considerably.⁵⁸ It extends it from luxury goods and 'conspicuous' consumption to basic goods and utilities like water, gas, and electricity. It is a history of both needs and wants.

To recognize the longer material tail of consumption, however, also creates fresh challenges: Just how far back in the chain of material processes should we go? In the beginning, when the study of consumption was fighting to establish itself as a field, there was sometimes an understandable urge to carve out its own terrain as distinct from that of work and production, which had been dominant for so long. This is no longer true and the interplay

⁵⁸ See also Frank Trentmann, 'Materiality in the Future of History: Things, Practices, and Politics', *Journal of British Studies* 48.2 (2009), 283–307.

between these spheres is today more widely recognized, though research on product innovation and design, the work carried out by consumers on a daily basis (recycling, repairing, booking their own flights, etc.), and the role of the workplace in providing goods and services and in shaping desires, norms and habits.⁵⁹

The question that now arises is *how* we connect the use of materials in consumption with what is happening in production. Of course, in the final analysis, ‘consumption is the sole end and purpose of all production’, as Adam Smith pointed out in *The Wealth of Nations* (1776). Ultimately, a car factory exists to make cars for consumers. But this does not offer the historian much direction. The path we chose depends on the question that is guiding our interest in the material world. What are we seeking to explain? If the question is to get a sense of the total flow of material in a region or in the world as a whole, then yes, it is imperative to study mining, the scars left by cement, and the amount of fossil fuels used, regardless of whether they are burnt in an industrial furnace or in a fireplace at home. From the perspective of the planet, it does not matter whether the cement went into a factory building or into basement extensions accommodating kitchens and game rooms. But this is not the only question, and material histories should not be limited to explaining climate change. If we want to understand the evolution of modern lifestyles and what people do with things, the material chains of interest will be different ones. Modern living uses up coal, oil, and aluminium; but, while an analysis of lifestyle can reveal all sort of material insights, it does not and cannot produce an account of the total demand for material. This would require an investigation of the efficiency of boilers and engines, industrial processes, farming

⁵⁹ Maxine Berg, ‘In Pursuit of Luxury: Global History and British Consumer Goods in the Eighteenth Century’, *Past & Present* 182.1 (2004), 85–142; Kathryn Wheeler and Miriam Glucksmann, *Household Recycling and Consumption Work: Social and Moral Economies* (London, 2015); Trentmann, *Empire of Things*, 522-61.

methods, and economic development, among other things. Power plants also consume coal and gas but these are different social processes from a family cooking a meal. That the thermal efficiency of a coal-fuelled electricity power plant rose from 5 per cent to 46 per cent in the last century is a fact and a precondition for cheaper electricity, but as such does not do much to help us understand why and how people live the material lives they do. If the latter is the overarching question, then it would probably not be a good idea for a historian to spend a lot of time researching coal bunkers or the changing design of turbines.

To be interesting and meaningful, therefore, material historians should reflect on what things are used for. These meanings and functions are social processes. The great challenge today is that these processes do not fit into the analytical containers we have inherited, but this challenge is also an opportunity for historians to develop their own approaches to those aspects of the material world that interest them. ‘Consumption’ does not have an inherent, self-explanatory meaning that is ready-made for historical use. In one extreme version, that gained ground in twentieth-century economics and beyond, it came to stand for an end user’s individual preferences. Arguably, this led to an overly discrete treatment of private consumption. At the same time, it would be a mistake to rush to the very opposite end and lump together all forms of material use, private and industrial, and include under consumption all the coal and matter used up in a factory, a view still held in the early nineteenth century. Private demand does have a life of its own: it is not just a function of supply. Between these two extremes lies a rich field for future historians to explore.

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