

## Moral economies and the cold chain\*

Susanne Freidberg

*Dartmouth College*

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### Abstract

In the late nineteenth and early twentieth centuries, the spread of what we now know as the cold chain sparked controversy in both Europe and North America. This article examines popular distrust of early refrigerated transport and storage in light of larger debates about how best to procure good food at a fair price. Expanding on E. P. Thompson's concept of moral economy, the article shows that refrigeration proved controversial not simply because it helped de-localize and industrialize food supply. It also challenged norms that had previously governed trade in perishables, especially those concerning transparency, naturalness and freshness.

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Mary Pennington, one of the foremost American authorities on refrigeration in the early twentieth century, often complained that her compatriots did not know where their food came from. Head of the U.S. department of agriculture's (U.S.D.A.) food research lab between 1908 and 1919, she spoke often about the increasing distances between farm and plate – distances, as she saw it, that represented great progress. In a talk titled 'Better food for the masses', delivered to a New York women's group in the late nineteen-twenties, she listed the many fruits and vegetables sold from pushcarts and markets in Manhattan's working-class neighbourhoods, even in mid winter: apples, bananas, lettuce, peas and 'even broccoli and escarole for the delight of the Italian households'. Unimaginable just a few decades earlier, this bounty from afar had, in turn, far-reaching benefits:

Never in any other era or in any other country has any people had such a wealth of wholesome food . . . Great and small cold storage warehouses and thousands of refrigerator cars have almost annihilated seasons and distances as our forefathers knew them. Better still, they have brought to all who have the intelligence to use them, foods which are builders of vitality and health . . . Without refrigeration . . . many a prosperous agricultural community would be non-existent and many a child would be stunted physically and sluggish mentally who is now strong and alert.<sup>1</sup>

She concluded by observing how otherwise intelligent people were 'notoriously ignorant' of how much refrigeration had improved their diets and lives. But this was perhaps not surprising: 'So quietly have these marvels been accomplished', she said, 'so unobtrusively during the past fifty years have the boundaries of our food supply widened, that only recently have we begun to tell our children the story of it'.<sup>2</sup>

\* This article is a revised version of a plenary lecture delivered at the 82nd Anglo-American Conference of Historians on the theme of 'Food in history', Institute of Historical Research, University of London, 11–13 July 2013.

<sup>1</sup> M. Pennington, 'Better food for the masses', *Ice and Refrigeration Illustrated*, lxxv (1928), 33–5.

<sup>2</sup> Pennington.

The spread of what we now know as the cold chain was in fact neither quiet nor unobtrusive. On the contrary, the introduction of refrigerated transport and storage unleashed fierce controversy in both the United States and Europe. Mary Pennington herself was known as ‘the voice of conscience in the refrigeration world’ precisely because she often had to speak in defence of technologies that many people feared and distrusted.<sup>3</sup> In the late nineteenth and early twentieth centuries, early refrigeration in fact sat at the centre of heated debates about how best to procure good food at a fair price. These debates were not new; nor, clearly, have they been resolved. But they were and remain intensely normative. Beyond the questions of exactly what counts as good food or a fair price lies the even more fraught one about what kinds of institutions and social relations should assure these things. This is the question that E. P. Thompson took up in his classic article on the moral economy in the eighteenth century, and one that has become, if anything, even more pressing in the twenty-first.<sup>4</sup>

The following account draws on Thompson’s basic notion of moral economy, but extends it in three ways. First, it assumes that norms about rights and responsibilities inform all economic institutions and activities, not just ‘pre-capitalist’ ones.<sup>5</sup> Second, it gives more explicit attention to technologies of food provisioning. Of particular concern are those technologies that affect transparency, by making it easier either to hide or to expose what the food contains or how much food there is. Arguably almost any technology that changes the distance between farm and mouth has this effect, even a donkey cart. But refrigeration did so in an especially radical fashion. And third, the article explores how moral economies are informed by ideas about the treatment of nature and non-human species.

Starting from this enlarged understanding of moral economy, the article aims to show that refrigeration caused controversy not just because it helped to delocalize, industrialize and standardize food supply; these processes are in any case more apparent in retrospect than in the moment. Rather, it proved controversial because of how fundamentally it challenged the everyday power relations and knowledge that governed commerce in perishable food. The article also contends that the type of transition that refrigeration has since undergone – from a food technology once considered both dangerous and immoral to a standard, even essential fixture of everyday life – was not inevitable. Such transitions do, however, inevitably have far-reaching moral and material implications – and again, not just for how we humans feed ourselves, but also for how we relate to nature, other species and to each other in order to do so.

The article draws from a larger study on the history of freshness in food, and how the meaning and value of this ideal changed along with the technologies that are supposed to protect it.<sup>6</sup> The idea for this study was itself triggered by a single and possibly apocryphal event, described in a footnote on the history of Paris’s Les Halles marketplace. In 1880 the fruit wholesaler Omer Decugis installed what was apparently France’s first commercial cold storage chamber in his store on the market’s outskirts. A native of southern France, Decugis had started shipping the region’s fruit to Paris thirty years before, not long after express rail service first made such a trade possible. He had since become one of the city’s most successful fruit dealers and probably saw

<sup>3</sup> B. Heggie, ‘Ice woman: Dr. Mary Engle Pennington’, *New Yorker*, xvii (1941).

<sup>4</sup> E. P. Thompson, ‘The moral economy of the English crowd in the 18th century’, *Past & Present*, 1 (1971), 76–136.

<sup>5</sup> A. Sayer, ‘Moral economy as critique’, *New Political Economy*, xii (2007), 261–70.

<sup>6</sup> S. Freidberg, *Fresh: a Perishable History* (Cambridge, Mass., 2009).

refrigeration – already used to store fruit in the United States – as a way both to reduce the risks of spoilage and to capitalize on late-season high prices. But his customers were not impressed. Instead, when they discovered that fruit marketed as fresh had in fact been stored under conditions of ‘artificial cold’, they were so outraged that Decugis, in order to regain their confidence, had the *frigo* destroyed in a public square.<sup>7</sup>

Little else is known about this episode. Yet it turns out to have been one of many instances when early commercial refrigeration provoked suspicion and distrust, and not only in France. Some of these are explored later in the article. First, though, it is worth remembering that this technology – distinct in scale, form and function from older domestic uses of ‘natural cold’ to preserve perishables<sup>8</sup> – emerged at a time when industrialization, urbanization and expanding transportation networks were together changing much about food supply. From roughly the last third of the nineteenth century to the first third of the twentieth, the spread of the cold chain both responded to and in some ways enabled these larger developments. Well before Mary Pennington’s time, then, refrigeration had its fierce advocates. In its potential to ‘annihilate seasons and distances’, as she put it, they saw a solution to some of the most pressing problems of modern food provisioning.

One of these was the problem of rising demand for fresh red meat. During the second half of the nineteenth century, many scientists considered this food essential to building strong bodies, armies and national economies. Fresh rather than dried or salted red meat was also one of the relative luxury foods that working classes across Europe – here the focus will remain on France and Britain – aspired to eat more regularly.<sup>9</sup> Rising meat prices in the eighteen-sixties reflected these new expectations, and sparked debate and government action in both countries. But the outcomes were quite different. In France, the government legalized the sale of horsemeat in 1866. As in much of Europe, taboos against eating such a ‘noble’ animal dated back centuries. But these taboos were fading, even at a time when the horse had never been more popular as a pet and status symbol.<sup>10</sup> Christopher Otter convincingly argues that change came about only because several things came together, including butchers willing to sell horsemeat, consumers willing to try it, and (perhaps most importantly) a sustained and explicitly moral campaign on the part of scientists, doctors and veterinarians.<sup>11</sup>

One of the initial leaders of this campaign was the zoologist Isidore Geoffroy Saint-Hilaire, whose arguments for legalizing horsemeat referenced nutrition,

<sup>7</sup> G. Chemla, *Les Ventres de Paris. Les Halles, la Villette, Rungis: l'histoire du plus grand marché du monde* (Grenoble, 1994), p. 213, n. 146. The descendants of Omer Decugis, still in the fruit business (though now trading on an intercontinental scale), claim to have no record of it. Nor do the archives of Paris’s *préfecture de police*, which at that time administered the city’s food markets. But when Omer Decugis’s family once again built a cold storage chamber in 1903, theirs was still the only produce shop in Paris to operate one (J. de Loverdo, *Monographie sur l'état actuel de l'industrie du froid en France* (Paris, 1910)).

<sup>8</sup> Depending on the region and season, these included the use of cellars, window shelves and icehouses. Domestic iceboxes became increasingly popular in the United States over the course of the 19th century, and quite a bit later in other countries (S. Shephard, *Pickled, Potted, and Canned: How the Art and Science of Food Preserving Changed the World* (New York, 2000); R. O. Cummings, *The American and his Food: a History of Food Habits in the United States* (Chicago, Ill., 1941); O. E. Anderson, *Refrigeration in America: a History of a New Technology and its Impact* (Princeton, N.J., 1953)).

<sup>9</sup> V. J. Knapp, ‘The democratization of meat and protein in late 18th- and 19th-century Europe’, *The Historian*, lix (1997), 541–51. R. Horowitz, J. M. Pilcher and S. Watts, ‘Meat for the multitudes: market culture in Paris, New York City, and Mexico City over the long 19th century’, *Amer. Hist. Rev.*, cix (2004), 1054–83.

<sup>10</sup> K. Weil, ‘They eat horses, don’t they? Hippophagy and Frenchness’, *Gastronomica*, vii (2007), 44–51.

<sup>11</sup> C. Otter, ‘Hippophagy in the UK: a failed dietary revolution’, *Endeavour*, xxxv (2011), 80–90.

efficiency, taste, labour productivity, charity and, not least, the welfare of the horse.<sup>12</sup> An animal with future food value, he reasoned, would enjoy a more humane old age than those worked until they dropped dead. The chief army veterinarian Emile Decroix, who led the legalization campaign after Geoffroy Saint-Hilaire's death in 1861, endorsed this argument, as did the Société protectrice des animaux de Paris (S.P.A.). As Alan Krinsky has observed, the S.P.A.'s support reflected more than a concern with the suffering of old horses:

On the one hand, the primarily bourgeois and aristocratic members of the society certainly felt a genuine concern for the malnourished . . . On the other hand these philanthropists feared potential violence from these same hungry people. Animal brutality led to desensitized individuals and threatened the social order. The provision of food relief could both help people and serve to suppress potential class unrest.<sup>13</sup>

In line with this latter concern, Decroix had horsemeat distributed free to poor families every Sunday.<sup>14</sup> He and other members of the campaign also organized a series of 'hippophagic banquets' in 1865–6, attended by select members of Parisian high society, including doctors, lawyers, journalists, government officials and businessmen.<sup>15</sup> The popularity of these banquets reflected a combination of curiosity about the dishes served – which included, ironically, horse mincemeat, the stuff of scandal more than 150 years later – and the legalization campaign's broad support among well-off Parisians. Apart from the banquets, however, horsemeat rarely made it onto the tables of wealthy gourmands.

The strict segregation of beef and horse butchering, evidenced in the mandatory horsehead displayed outside every *boucherie chevaline*, acknowledged that status divide.<sup>16</sup> But it also underscored a core principle of what Kyri Clafin calls the 'moral market': namely, complete (and if necessary legally enforced) transparency of information.<sup>17</sup> This principle, which informed many of the norms and regulations governing French food commerce, re-enters the story shortly. The point here is that it was just one of several conditions and forces that together eventually overcame a longstanding taboo, and that helped to turn France into 'the horseflesh center of the Western world' by the early twentieth century.<sup>18</sup> It was hardly inevitable that an available meat would become an acceptable one, however acute the demand.

One only has to look across the Channel to find evidence for that point. In Britain in the nineteenth century, the sale of horsemeat was legal, though most legitimate sales were for pet food. It was otherwise considered an adulterant, hidden in and passed off as better meat than it was.<sup>19</sup> Britain's own horsemeat campaigners wanted to change that, and the 'meat famine' of the late eighteen-sixties appeared an opportunity to do so. They made most of the same arguments as their French counterparts (in fact quoted them); they held their own horsemeat banquet in London in 1868, employing French

<sup>12</sup> I. G. Saint-Hilaire, *Lettres sur les substances alimentaires, et particulièrement sur la viande de cheval* (Paris, 1856).

<sup>13</sup> A. D. Krinsky, 'Let them eat horsemeat! Science, philanthropy, state, and the search for complete nutrition in 19th-century France' (unpublished University of Wisconsin-Madison Ph.D. thesis, 2001), p. 200.

<sup>14</sup> D. W. Gade, 'Horsemeat as human food in France', *Ecology of Food and Nutrition*, v (1976), 1–11, at p. 3.

<sup>15</sup> *Usage alimentaire de la viande de cheval: banquet des hippophages* (Paris, 1865), p. 22.

<sup>16</sup> Otter, p. 83.

<sup>17</sup> K. W. Clafin, 'Les Halles and the moral market: frigophobia strikes in the belly of Paris', in *Food and Morality: Proceedings of the Oxford Symposium on Food and Cookery 2007* (Oxford, 2008), pp. 82–92.

<sup>18</sup> Gade.

<sup>19</sup> Otter, p. 83.

chefs; and they proposed calling the meat *cheval*, to hide its horsiness. Of course all this only reinforced its association with Frenchness. At a time of rising nationalism, such associations were hardly strategic. Even the nutritional endorsement of the German chemist Justus von Liebig – whose name helped to make the fortunes of the London-based Liebig's beef extract company – failed to win over either British scientists or consumers.<sup>20</sup>

Instead, Britain looked overseas for a fix to the meat problem, to lands where proper red meat – beef and mutton – was abundant and cheap. The question was how to obtain it in fresh form, at a time when shipping live animals was increasingly considered both risky and cruel.<sup>21</sup> The British Royal Society of Arts invited inventors to take up this challenge by holding a contest, offering prize money for promising innovations in meat preservation and transport. Some of the many entries included Australian beef soaked in calcium sulphite and then packed in barrels of melted butter, Uruguayan meat injected with an 'anti-putrescent solution', and a mysterious powder that claimed to make spoiled meat fresh again.<sup>22</sup> As one of the contestants wrote in the society's journal, the broader cause of globalizing food demanded bold innovation:

While in our densely populated towns and districts we can scarcely supply sufficient cheap food for the bodily sustenance of our labouring population who chiefly require good animal food . . . and while at the same time there exists in other regions of the earth a superabundance of animal food not only fit for sustenance but of excellent quality, it should be the duty of every philanthropist – to say nothing of mercantile and social interests – to make use of the abundance of one part of the earth for the supply of the necessities of another part, and thus act up to the precept of our great Exemplar, who required his followers to gather up the fragments, that nothing should be lost.<sup>23</sup>

The most moral economy, in other words, was the global one. This was a vision shared by the French engineer Charles Tellier, inventor of the first successful on-board refrigeration system. Two goals drove Tellier. One was to bring consumers 'la vie à bon marché' (roughly, 'the good life for less'), meaning a life full of fresh, affordable red meat.<sup>24</sup> And the second was to bring commerce and prosperity – in a word, development – to the world's resource-rich backwaters. Nowhere was this second goal more warmly applauded than in Buenos Aires, where Tellier's *Le Frigorifique*, loaded with chilled French beef, docked in 1877 after a 105-day test run. At an on-board banquet, the local newspapers described the well-aged steak as 'excellent, bloody, savoury'. They also celebrated the end of the country's commercial isolation: 'Hurray', one cheered, 'Hurray a thousand times for the revolutions of science and capital. The dawn of a new day rises'.<sup>25</sup>

<sup>20</sup> M. R. Finlay, 'Early marketing of the theory of nutrition: the science and culture of Liebig's extract of meat', in *The Science and Culture of Nutrition, 1840–1940*, ed. H. Kamminga and A. Cunningham (Atlanta, Ga., 1995), pp. 48–76; Otter, p. 84.

<sup>21</sup> R. Perren, *The Meat Trade in Britain, 1840–1914* (1978), pp. 108–14; I. M. Greg, *Cattle Ships, and our Meat Supply* (1899); C. Elliot, 'The preservation of food', *Jour. Society of Arts*, ix (1861), 95–7.

<sup>22</sup> J. C. Drummond and A. Wilbraham, *The Englishman's Food: a History of Five Centuries of English Diet* (1958), pp. 316–17.

<sup>23</sup> G. C. Steet, 'On the preservation of food, especially fresh meat and fish, and the best form for import and provisioning armies, ships and expeditions', *Jour. Society of Arts*, xiii (1865), 309–15, at p. 315.

<sup>24</sup> C. L. A. Tellier, *La Vie à Bon Marché* (Paris, 1880).

<sup>25</sup> C. L. A. Tellier, *Communication aux actionnaires de la société fondatrice pour la conservation de la viande fraîche par le froid* (Paris, 1877), pp. 15–16, 30–3; C. L. A. Tellier, *Histoire d'une invention moderne: le frigorifique* (Paris, 1910); 'Le "Frigorifique" à Buenos-Ayres', *L'Illustration*, 10 March 1877, p. 151.

A new era of trans-hemispheric commerce was indeed beginning. British investment in Buenos Aires-based meatpacking plants soon took off, as did the construction of a British fleet of refrigerated steamers. Within a matter of years, Argentina became the world's largest exporter of first frozen and later chilled beef, while Britain became far and away the world's largest importer.<sup>26</sup> By the eve of the First World War, British consumers on average ate 50 per cent more meat than they had seventy-five years before.<sup>27</sup> Initially, 'dead meat' from the Americas – both North and South – did run up against both British consumers' distrust and the opposition of butchers and livestock interests.<sup>28</sup> But marketing and technical advances wore down the first, while strong political support for open markets diminished the clout of the second.<sup>29</sup>

In turn-of-the-century Britain, in other words, the transnational cold chain both strengthened and gained strength from the conviction that free trade was fair trade.<sup>30</sup> Both turned former foods of privilege – white bread and sugar, red meat and oranges – into affordable provisions for all.<sup>31</sup> Both also helped to preserve Britain's renown as a nation of beef-eaters, not horse-eaters. This identity in turn reaffirmed the social and economic status of both meats, ensuring that the latter would remain a lowly adulterant. But with the help of free trade and the cold chain (and as the 2013 horsemeat scandal demonstrated), it also became a highly accessible one.<sup>32</sup>

In France, by contrast, refrigerated transport met with a chilly welcome. Alarmed by the prospects of cheap Pampas beef flooding their markets, French butchers' and farmers' unions quickly mobilized, convincing the government to enact tariffs and hygiene laws that effectively shut down the trade for the next quarter of a century.<sup>33</sup> Charles Tellier's efforts to attract investors in refrigerated shipping went nowhere; he died so poor that it was rumoured he starved to death.<sup>34</sup> Only in 1912, faced with hyperinflation and food riots, did the government start to allow limited imports of *frigo* meat. Even then, French consumers remained wary of a product that depended so entirely on 'artificial cold'. Here it is worth recalling the earlier episode of outrage directed at the Parisian fruit wholesaler. What French refrigeration engineers called 'frigoriphobie' described two distinct fears.<sup>35</sup> First, people worried how this technology might harm the quality and safety of their food.<sup>36</sup> These concerns were perhaps especially pronounced in France, but not found only there. Even in the United States,

<sup>26</sup> J. T. Critchell and J. Raymond, *A History of the Frozen Meat Trade* (1912).

<sup>27</sup> R. Perren, *Taste, Trade and Technology: the Development of the International Meat Industry since 1840* (Aldershot, 2006), p. 3.

<sup>28</sup> Perren, *Meat Trade*, pp. 127–9; R. A. Clemen, *The American Livestock and Meat Industry* (New York, 1923), pp. 279–80.

<sup>29</sup> Clemen, pp. 281–3; J. P. Huttman, 'British meat imports in the free trade area', *Agricultural Hist.*, lii (1978), 247–62.

<sup>30</sup> F. Trentmann, 'Before "fair trade": empire, free trade, and the moral economies of food in the modern world', *Environment and Planning D: Society and Space*, xxv (2007), 1079–102.

<sup>31</sup> F. Trentmann, *Free Trade Nation: Commerce, Consumption, and Civil Society in Modern Britain* (Oxford, 2008).

<sup>32</sup> M. Chalabi, 'Horsemeat: EU imports and exports data', *The Guardian* <<http://www.theguardian.com/news/datablog/2013/feb/13/horsemeat-uk-eu-imports-exports>> [accessed 2 Sept. 2013].

<sup>33</sup> E. Menalque, 'Les frigorifiques dans les abattoirs', *L'Industrie Frigorifique*, ii (Sept. 1904), 273–8.

<sup>34</sup> G. A. Le Roy, *La Mort de Charles Tellier: ses obsèques* (Paris, 1913).

<sup>35</sup> 'Le Frigoriphobie', *L'Industrie Frigorifique*, xi (Apr. 1913), 126.

<sup>36</sup> Reprint of 'Conseil générale de la Seine Paris, séance du 21 Juin', *Revue générale du froid et des industries frigorifiques*, iii (Aug. 1911), 373–85; 'L'Etiquetage des fruits conservés par le froid et le phobie du froid', *Revue générale du froid et des industries frigorifiques*, iii (Nov. 1911), 536–8.

where refrigeration spread earlier and faster than in other countries, suspicions about the links between cold storage and assorted diseases (among them cholera, cancer and appendicitis) came and went for years.<sup>37</sup>

Second, in France merchants' very capacity to store perishable foods was widely viewed as a breach of marketplace transparency and thus morality. Indeed the term for storeroom, 'la resserre', connoted 'hidden away'.<sup>38</sup> Up to the First World War, the regulations governing Les Halles market in Paris forbade overnight storage, primarily in order to protect consumers and producers from the hoarding, price rigging and sales of substandard produce that storage could enable. In addition, the obligation to liquidate stocks at closing time forced merchants to drop prices later in the day, making their goods more affordable to poorer customers. Refrigeration would potentially threaten all these dimensions of the moral marketplace. By slowing perishability it would increase merchants' bargaining power vis-à-vis both suppliers and buyers.

Yet advocates of refrigeration in France had their own moral arguments, among them that no cold storage in the markets meant more waste and thus overall higher prices.<sup>39</sup> This perspective began to receive more serious attention when food prices climbed precipitously in the early nineteen-tens. Spoiled produce was a visible and oft-reported problem at Les Halles, and once war broke out, it became an increasingly unacceptable one: 'Every loss of foodstuffs is a veritable public calamity', wrote one pro-refrigeration city council member in 1915.<sup>40</sup> By 1917, the construction of two cold storage chambers had begun at Les Halles. But they were not completed until after the war's end, and even then their frequent misuse – doors left open most of the day, foods piled haphazardly – did little to stop spoilage. This, combined with merchants' tendency to store produce in half-spoiled condition (a condition for which they then blamed refrigeration), ensured that popular *frigoriphobie* did not fade quickly.<sup>41</sup>

In France and other societies accustomed to daily or even twice-daily provisioning, early suspicions of refrigeration appear, in retrospect, not so surprising. What purpose could it serve, if most goods were traditionally bought and consumed before they went

<sup>37</sup> The trade journal *Ice and Refrigeration* reported on and generally scorned these rumours. In Feb. 1894, it described the 'concerted attack' on the refrigerated beef industry in San Francisco by health officers, physicians and 'anti-monopoly newspapers': 'The ground of the attack by these long-eared worthies is that the beef, because it is cooled in a mechanically refrigerated cooling room, is unwholesome! One "Dr.", who by some strange and fitful fate of circumstance is a member of the board of health, says, with owlsh wisdom of rare composition: "Meat put at once into cold storage, with the animal heat in it – alive, I might say – is likely to go to pieces when exposed to the air; in plain English, to rot. Such meat is, of course, utterly unfit to eat, and the person who does eat it is bidding for an attack of cholera-morbus"' ('Packing house refrigeration', *Ice and Refrigeration Illustrated*, vi (Feb. 1894), 112). The journal also covered refrigeration attitudes in Britain, where members of parliament as well as physicians publicly speculated about the possible links between refrigerated food and diseases such as appendicitis and cancer ('Refrigeration abroad', *Ice and Refrigeration Illustrated*, xxvi (Apr. 1904), 245).

<sup>38</sup> Archives de Paris, 1338W 1144, rapport présenté par M. Bouche de la commission supérieure des Halles, n.d (quoted in Claffin, p. 85).

<sup>39</sup> 'L'utilisation du froid artificiel aux Halles Centrales de Paris', *Revue générale du froid et des industries frigorifiques*, ii (March 1910), 2; 'Le rôle du froid dans la crise de la vie chère', *Revue générale du froid et des industries frigorifiques*, iii (Nov. 1911), 484–507; G. De Nouvion, 'La crise alimentaire et l'industrie frigorifique', *Journal du syndicat de la boucherie de Paris* (March 1912), p. 1.

<sup>40</sup> Paris, Archives de la Préfecture de Police, DB/345, Ambroise Rendu, rapport au nom du bureau 1, sur l'organisation de l'office départemental d'approvisionnement, n. 14, conseil générale de la Seine, 1915 (quoted in Claffin, p. 87).

<sup>41</sup> M. Piettre, *Introduction aux diverses techniques de conservation des denrées périssables* (Paris, 1934), p. 216.

bad? Such doubts only subsided entirely as the very rhythms and geographies of daily life changed, and as the cold chain reached from the markets and shops into consumers' kitchens. There the refrigerator proved more self-evidently useful.<sup>42</sup> Yet to the extent that *frigophobia* reflected concerns about transparency and fairness, it was by no means uniquely French. Even in the United States, called by one historian 'the first refrigerated nation',<sup>43</sup> cold storage sparked episodes of major controversy.

The United States earned this status through the early and widespread use of ice. Although the founders of the New England ice trade originally set their sights on export markets – ice harvested from ponds around Boston, Massachusetts, beginning in 1805, eventually reached ports from Havana to Calcutta – local households and businesses soon accounted for the bulk of sales.<sup>44</sup> By mid century midwestern meatpackers used both harvested and manufactured ice to extend first their seasons and then their rail shipping routes. By the end of the eighteen-sixties, rail lines equipped with ice-chilled 'reefer' cars reached California, where fresh fruit, vegetable and egg production for the east coast market gave rise to prosperous farming communities.<sup>45</sup> Around the same time, the storing of perishables in ice-chilled warehouses became a major business in itself, especially in entrepôt and eastern seaboard cities such as Cleveland, Chicago and Boston. By the century's end the United States boasted around 600 such warehouses, most employing ammonia-compression refrigeration and many of them several storeys tall.<sup>46</sup> Far more than in any other country, the cold chain had become an integral part of the commercial landscape. Some observers attributed its rapid development to sheer necessity, given the long distances and extreme weather characterizing United States geography, others to American pragmatism and technological optimism.<sup>47</sup>

Indeed, except when warehouses caught fire – most catastrophically at the Chicago World's Fair in 1893, when seventeen firemen died – cold storage initially attracted mostly positive commentary from the American press.<sup>48</sup> Journalists marvelled at the size, bounty and sheer coldness of the warehouses. As the *Boston Globe* said of a new five-storey construction in 1889:

Arctic currents circulate throughout the big structure and freeze partridges, grouse, trout, pigs and the various soups that preface hotel bills of fare. Thousands and thousands of tubs of butter, thousands and thousands of barrels of carrots, apples and pears are also in the building, but exposed to a temperature which, while it does not congeal their succulent juices, banishes

<sup>42</sup> 'Ice in Europe', *Ice and Refrigeration Illustrated*, iii (Nov. 1892), 359–62; R. L. Frost, 'Machine liberation: inventing housewives and home appliances in interwar France', *French Hist. Stud.*, xviii (1993), 109–30.

<sup>43</sup> G. Weightman, *The Frozen Water Trade: a True Story* (New York, 2003), p. 12.

<sup>44</sup> Weightman; R. O. Cummings, *The American Ice Harvests: a Historical Study in Technology, 1800–1918* (Berkeley, Calif., 1949); D. G. Dickason, 'The 19th-century Indo-American ice trade: an hyperborean epic', *Modern Asian Stud.*, xxv (1991), 53–89.

<sup>45</sup> S. Stoll, *The Fruits of Natural Advantage: Making the Industrial Countryside in California* (Berkeley, Calif., 1998); D. C. Sackman, *Orange Empire: California and the Fruits of Eden* (Berkeley, Calif., 2005); K. Kann, *Comrades and Chicken Ranchers: the Story of a California Jewish Community* (Ithaca, N.Y., 1993).

<sup>46</sup> On the technological development of cold storage, see Anderson; B. Donaldson and B. Nagengast, *Heat and Cold. Mastering the Great Indoors: a Selective History of Heating, Ventilation, Air-conditioning and Refrigeration from the Ancients to the 1930s* (Atlanta, Ga., 1994).

<sup>47</sup> L. Houllévigüe, 'Causerie scientifique: le congrès du froid', *Journal du syndicat de la boucherie de Paris* (1912), p. 2. On technological optimism, see L. Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (Oxford, 1964).

<sup>48</sup> J. Rees "'I did not know . . . any danger was attached": safety consciousness in the early American ice and refrigeration industries', *Technology and Culture*, xlvi (2005), 541–60.

matter destructive to vegetable life. To inspect this immense larder from top to bottom would make one's mouth water, if there were not the actual danger of freezing.<sup>49</sup>

The *Chicago Tribune* wrote even more glowingly about the benefits of cold storage to both producers and consumers:

As Pharaoh, acting under the advice of Joseph, stored up the surplus harvest of seven years to meet the famine which was to come, so is man gradually learning how to store up all his surplus products against the hour of need . . . The Tribune gives assurance that after these food products have been brought here they will not be spoiled or wasted, but will remain in perfect condition . . . [the warehousemen] will have given the producer the certainty of the sale of all he ships to them. They will have the consumer prices steadier and on the average lower than present ones, and will have taken for themselves simply what would otherwise have been thrown away and lost, profiting no one.<sup>50</sup>

This praise overlooked the rudimentary thermostats of some of the earlier warehouses, not to mention their operators' limited knowledge about what temperatures best suited which foods. It also made no mention of these warehouses' capacity to hide the types of nefarious practices that the regulations governing Paris's Les Halles had long sought to prevent. These practices only became the stuff of headlines and then reform movements in the early twentieth century. At that point, one of the most commonly cold-stored commodities, the egg, also became one of the most controversial.

Two qualities of the egg made it suitable for refrigerated storage. First, it is durable: under the right conditions, eggs can remain edible for several months. They age by losing moisture through their shells. Cool temperatures help slow that process, but long before refrigeration, people had various home methods for keeping eggs 'fresh' for up to two years (or so it was claimed). Most of these methods centred on slowing dehydration, either by applying butter or varnish to the shells or by storing the eggs themselves in a sodium silicate solution, also known as glass-water.<sup>51</sup>

Second, historically the egg was a highly seasonal crop. Hens began laying in late winter or early spring, when the days grew long and warm enough. Except for a few varieties that laid off-season eggs if kept warm and well fed – the so-called 'everlasting layers' – most hens laid the majority of their eggs in springtime.<sup>52</sup> This makes evolutionary sense, since chicks hatched in spring would stand a better chance of survival. But it meant that for much of the year, including the holiday baking season, fresh-laid eggs were scarce; hence all the home storage methods, which assured that cooks did not have to 'disappoint the little folks of their Christmas plum pudding'.<sup>53</sup>

And hence also the incentive to store spring eggs on an industrial scale, once it became possible to do so. Warehouses in the major cities filled up with stocks hauled from egg-towns across the country. Boston's Quincy Market could hold up to 150 million of them at once, which if 'laid end to end would reach from Boston to San Francisco, and back to Chicago again'.<sup>54</sup> In the early years eggs, like other cold stored commodities, suffered from the warehouses' technical shortcomings, such as uneven

<sup>49</sup> 'Cold storage', *Boston Globe*, 22 Dec. 1889.

<sup>50</sup> 'A vast cold storage warehouse', *Chicago Tribune*, 1 Apr. 1890.

<sup>51</sup> See, e.g., A. W. Chase, *Dr. Chase's Third, Last and Complete Receipt Book and Household Physician* (Detroit, Mich., 1891); W.V. Cruess, *Home and Farm Food Preservation* (New York, 1918), p. 149; D. M., Hughes, *Thrifty in the Household* (Boston, Mass., 1918), pp. 82–6.

<sup>52</sup> D. J. Browne and S. Allen, *The American Poultry Yard: Comprising the Origin, History, and Description of the Different Breeds of Domestic Poultry . . .* (New York, 1850), p. 30.

<sup>53</sup> Browne and Allen, p. 97.

<sup>54</sup> 'Advertising cold storage', *Ice and Refrigeration Illustrated*, lxxiii (1927), 347–9.

temperatures and poor air circulation. Eggs were particularly prone to absorbing the odours of produce stored nearby, leading to reports of stocks with ‘a fruity flavor’.<sup>55</sup> Unpredictable quality helped to maintain the price gap between cold storage eggs and those few marketed as ‘strictly fresh’ in autumn and winter. But the real problem was not the technology so much as how easily it could be used, especially in the case of eggs, to deceive, cheat and perhaps endanger consumers.

In the early years, merchants routinely stored eggs without candling to check for rot or staleness. Retailers later bought them, according to one U.S.D.A. study, ‘in the blind faith that some magic property of cold storage had made good eggs of all the bad eggs, or else accepted the situation as one for which they were not responsible and which they could not remedy’.<sup>56</sup> Initially warehouse owners also refused to accept any responsibility, pointing out that it was their job only to store food, not to assure its quality. Eventually they did impose some standards, among them that eggs be candled before storage. But this did not prevent dealers from selling their best stored eggs as ‘freshly-laid’ and the rest as storage stock. Known as ‘bootlegging’, this practice of course simply reinforced prejudices against the latter.<sup>57</sup>

Warehouse standards also did not counter the increasingly widespread belief that the very practice of storing perishables amounted to immoral speculation. Certainly it was speculation; the merchants involved were widely known as ‘egg-gamblers’. Before laying season began they contracted to buy anywhere from hundreds to tens of thousands of cases of future eggs. Their aim was to beat the market at the time of purchase, and to profit again when they sold the eggs several months later.<sup>58</sup> But did this constitute hoarding? Did it drive up prices? The merchants themselves insisted that, on the contrary, storage made off-season eggs much cheaper. Plus, they contended, farmers protected against spring gluts would produce more, thus increasing overall supply.<sup>59</sup>

However familiar and rational this argument, it proved especially unconvincing once food prices began to climb in 1909. Already the newspapers had begun to report on a suspected ‘egg trust’.<sup>60</sup> It was not an entirely accurate characterization, given that many cold storage warehouses were owned either by municipalities or relatively small companies.<sup>61</sup> Most egg gamblers were also small concerns compared to members of the notorious Chicago ‘beef trust’ (though some of the latter did dabble in egg storage). Any control over the egg market was ultimately fragile, since an unexpectedly early spring or even a winter thaw could set off the laying season, and a subsequent plunge in prices. When this happened in the spring of 1905, the *Los Angeles Times* headlined the story, ‘The hen as a trust buster’.<sup>62</sup>

<sup>55</sup> ‘Eggs have fruity flavor: forty thousand in Boston found to have a novel taste’, *New York Times*, 31 Aug. 1900.

<sup>56</sup> I. C. Franklin, ‘The service of cold storage in the conservation of foodstuffs’, *Yearbook of the United States Department of Agriculture* (Washington, D.C., 1917), pp. 363–70, at p. 366.

<sup>57</sup> ‘The senate committee hearings’, *Ice and Refrigeration*, xxxviii (1910), 385–7; W. M. O’Keefe, ‘Cold storage division A. W. A.’, *Ice and Refrigeration*, lxxviii (1930), 513–15.

<sup>58</sup> A. W. McCann, *Thirty Cent Bread: How to Escape a Higher Cost of Living* (New York, 1917), pp. 72–4.

<sup>59</sup> Egg production did increase from approximately 450 million dozen in 1880 to 1.9 billion dozen in 1907 (S. Van der Vaart, ‘Growth and present status of the refrigerating industry in the United States’, in *Premier congrès international du froid: Paris, 5 au 12 octobre 1908*, ed. J. de Loverdo (Paris, 1908), pp. 330–50).

<sup>60</sup> ‘Ruined by trust’, *Boston Daily Globe*, 24 Apr. 1902, p. 1; ‘Corner in eggs’, *Hartford Courant*, 19 Apr. 1902, p. 1.

<sup>61</sup> Massachusetts Commission on Cold Storage of Food, *Report of the Commission to Investigate the Subject of the Cold Storage of Food and of Food Products Kept in Cold Storage* (Boston, Mass., 1912), pp. 94–6.

<sup>62</sup> ‘The hen as a trust buster’, *Los Angeles Times*, 7 May 1905.

Suspicion about an egg trust makes more sense if the latter is understood as a collusion not of the few but rather of the refrigerated. No one seemed quite sure who belonged to this trust or how much food they controlled. But refrigeration's complicity appeared obvious. In a letter to the *Washington Post*, a reader observed that the explanation for high food prices was 'very simple':

It is not because food is scarce. It is because there is a food trust . . . I don't think it is an organized concern, but to all intents and purposes, it might as well be. I understand that in our own markets, right here in town, the dealers get together and decide on prices before they open their stalls. Cold storage is responsible for the prices they charge . . . They have thousands and thousands of eggs, but keep them in the refrigerator, in order to keep prices high.<sup>63</sup>

Egg dealers and the warehouse industry responded to these attacks with their own propaganda. The trade journal *Ice and Refrigeration* recommended recipe booklets and informational advertising to appease the 'agitation' of consumers who 'do not understand the function of a cold storage warehouse, and do not understand anything but the simple fact that here is a big building . . . containing food that they want to get hold of'.<sup>64</sup>

The industry also courted politicians, with mixed results. In 1911 Chicago's city officials, for example, were invited to a cold storage banquet featuring dishes prepared entirely from cold storage products. The *Tribune* announced the event with the headline 'To dine on embalmed food'.<sup>65</sup> By that time, officials at city, state and even the U.S. senate level had already debated legislation that would require time limits and labelling on all cold storage foods. Questions of freshness and fairness were rarely far apart. The U.S. senate, in particular, drew on the testimony of experts such as Mary Pennington, who not surprisingly defended the technology. Retailers' tendency to sell only substandard goods as 'stored' and everything else as 'fresh' had led to unwarranted consumer prejudice. Elsewhere, though, she suggested that consumers' own unrealistic expectations encouraged retailer fraud:

Because the consumer has insisted that he must have produce 'right fresh from the country,' the vendor has imposed upon his ignorance by pretending to give it to him. In reality the vendor cannot obtain such goods as his customer demands, hence the falsehoods that are a part of the stock in trade of every retailer. The consumer is justified in rebelling against the falsehoods; and the produce-man can just as strongly insist that the consumer shall inform himself about the conditions governing the food supply, especially in the great cities, and not make almost every sale contingent upon an untruth.<sup>66</sup>

Although the senate cold storage bill did not pass, many at the city and state level did. But since the new 'storage' labels ended up on egg cartons rather than on the eggs themselves, they did little to stop the old practice of bootlegging. California, for instance, passed a cold storage law in 1915; ten years later the state's board of health reported that due to 'a temptation, irresistible by many dealers, to candle out the better grades of cold storage stock and sell them to retailers as fresh eggs . . . it is estimated

<sup>63</sup> 'A trust in food?', *Washington Post*, 11 Dec. 1909.

<sup>64</sup> T. A. Bird, 'The ice man as an advertiser', *Ice and Refrigeration*, xxxviii (1910), 44–45, at p. 45.

<sup>65</sup> 'To dine on embalmed food: produce merchants invite city officials to cold storage meal', *Chicago Daily Tribune*, 27 Sept. 1911.

<sup>66</sup> 'Senate committee hearings', *Ice and Refrigeration Illustrated*, xxxviii (1910), 385–7, at p. 386; M. E. Pennington, 'Relation of cold storage to the food supply and the consumer', *Annals of the American Academy of Political and Social Science*, xlvi (1913), 154–63, at p. 155.

that 75 percent of the cold storage pack has been “bootlegged”.<sup>67</sup> Under such circumstances, consumer prejudice against cold stored eggs remained largely intact, as did the price differential between stored and ostensibly ‘fresh-laid’ eggs.

The ultimate solution to the moral hazard of the cold storage egg lay in neither laws nor labels. Rather, it came only when commercial cold storage was itself rendered obsolete, along with the seasonality of the fresh-laid egg.<sup>68</sup> Farmers had long tried different methods to encourage hens to lay more eggs during the autumn and winter. They knew that warm coops and rich feed helped, as did removing eggs promptly from the nest, to discourage hens’ instinct to incubate them (known as ‘broodiness’).<sup>69</sup> Poultry breeders also tried to encourage ‘ever-laying’ traits. But the most dramatic results came, quite literally, at the flick of switch. As electric lighting began to arrive on farms in the early years of the twentieth century, farmers began to realize that their hens saw no difference between the sun and a light bulb. This meant that they could effectively be ‘tricked’ into thinking it was springtime – and thus laying season – even in the dead of winter. One early report of this discovery came from a Cambridge, Massachusetts farmer who called it ‘the most definitive control of production that we have. You can turn it on with a switch or turn it off’. In 1919, *Scientific American* magazine called the effects of lights on hens ‘neither more nor less than a miracle’.<sup>70</sup>

It took a while for this miracle to catch on. Most farmers still did not have electricity in the nineteen-twenties, and did not want to risk fires from gas lanterns. Many farmers must also have been scared off by reports that artificial lighting, improperly used, might backfire. Poultry trade journals described hens ‘worn-out’ before their time. As the *Hen Coop* put it, ‘A bird cannot be kept off her perch from 4 am until 9 am without showing the effect of the daily grind for eggs’. *Leghorn World* warned that ‘slight mistakes . . . may have disastrous effects as birds are under more or less artificial conditions . . . it was found that discontinuing the use of lights suddenly dropped the egg production from about 30 per cent to almost zero over two weeks’.<sup>71</sup> By the nineteen-thirties opinion began to shift, as more poultry science studies found that all-night light (as opposed to just a few hours at sunset and dawn) increased off-season laying so effectively as to outweigh any springtime exhaustion – especially since that was a profitable time to sell chickens for meat.<sup>72</sup> As New Deal funding brought electricity to rural areas across the country, henhouse lighting became more commonplace. Some advertisements for the new equipment emphasized how it would boost ‘henhouse morale’, others how the extra profits from winter eggs would help to pay for lighting in farmers’ own houses.<sup>73</sup>

By the late nineteen-forties, the belief that hens needed regular exercise, sunshine and fresh air was giving way to the idea that lifetime confinement (combined with a

<sup>67</sup> O’Keefe, p. 515.

<sup>68</sup> For greater detail, see Freidberg.

<sup>69</sup> Browne, pp. 71, 83; K. J. Cooke, ‘From science to practice, or practice to science? Chickens and eggs in Raymond Pearl’s agricultural breeding research, 1907–16’, *Isis*, lxxxviii (1997), 62–86; E. Cobb, *The Hen at Work: a Brief Manual of Home Poultry Culture* (New York, 1919).

<sup>70</sup> Quoted in P. Smith and C. Daniel, *The Chicken Book* (Boston, Mass., 1975), p. 264.

<sup>71</sup> ‘Interest in forced egg production waning’, *The Hen Coop*, vi (1922), 1; Y. P. Bhosale, ‘How to secure more eggs in winter’, *Leghorn World*, xi (1926), 53.

<sup>72</sup> D. C. Kennard and V. D. Chamberlin, *All-night Light for Layers* (Wooster, Ohio, 1931).

<sup>73</sup> ‘Use of winter lighting’, *American Egg and Poultry Rev.*, i (1940), 19; ‘Let your extra poultry profits pay for DELCO-LIGHT’, *American Egg and Poultry Rev.*, iii (1942), back cover.

steady diet of antibiotics) was efficient, clean and altogether modern. By then as well, winter egg production had increased more than 80 per cent from fifteen years before, and demand for cold-stored stocks was drying up.<sup>74</sup> Soon it was the chickens, not the eggs, that were hidden away in giant climate-controlled warehouses. But their eggs, laid on average daily, could at least now claim to be reliably, relatively fresh.

One could conclude that the moral of the story of the egg is to be careful what one wishes for. But one could draw that conclusion from much of modern food history. In the solutions to one era's problems lie the seed of the next era's plagues: from dearth to excess, from pests to toxic pesticides, from the 'relative monotony of the seasonal diet', as Barbara Adam puts it, 'to the absolute monotony of all-year sameness . . . as well as a staggering lack of taste'.<sup>75</sup> This common theme in food history should make us not so much nostalgic for diets past as wary of those who claim to have arrived, finally, at the most enlightened one.

Beyond eggs, the story of refrigeration more broadly offers another conclusion: namely, that controversial food technologies become acceptable not because people get used to them (contrary to what sellers of such technologies might hope) but because they prove themselves useful. The cold chain ultimately did that, especially once it arrived in home kitchens in the nineteen-twenties and thirties in the United States, and later elsewhere. Refrigeration eventually helped people to live what they considered more moral lives, insofar as it allowed them to exercise thrift, maintain health and express familial and community care.<sup>76</sup> Like the contents of the refrigerator itself, however, categories of good and bad food technology are not stable. Almost a century after the great debates around cold storage began to subside, reports of the restaurant industry's widespread use of frozen food are again making headlines in France, with calls for new laws and labels to prevent this apparent crime against transparency.<sup>77</sup> Clearly this history is an on-going one.

<sup>74</sup> 'Rate of production mounting', *American Egg and Poultry Rev.*, ii (1941), 106.

<sup>75</sup> B. Adam, 'Industrial food for thought: timescapes of risk', *Environmental Values*, viii (1999), 219–38, at p. 227.

<sup>76</sup> These themes inform much of the mid 20th-century advertising for refrigerators found in women's magazines such as *Good Housekeeping*. See also P. R. Grahame, 'Objects, texts, and practices: the refrigerator in consumer discourses between the wars', in *The Socialness of Things: Essays on the Socio-Semiotics of Objects*, ed. S. H. Riggins (New York, 1994), pp. 285–307.

<sup>77</sup> A. Abad-Santos, 'French chefs are serving you frozen factory food and you don't even know it', *The Atlantic Wire*, 10 July 2013 <<http://www.theatlanticwire.com/entertainment/2013/07/french-chefs-are-serving-you-frozen-factory-food-and-you-dont-even-know-it/67041/>> [accessed 6 Sept. 2013].