



REFRIGERATOR

The Story of Cool in the Kitchen

HELEN PEAVITT

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REAKTION BOOKS

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*To all my loved ones – near and far, and for coffee.
I think I thought of all of you as I wrote. You will
be seeing much more of me now, except the coffee.*

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INTRODUCTION

Last year, I made a refrigerator in my basement. And I needed to because I needed to figure how – you know there is no such thing as ‘cold’. There is only less heat.

Alton Brown, 2005¹

In 2012 the Royal Society, at the vanguard of research into heat and temperature for over three hundred years, aptly named refrigeration as *the* most important innovation in the history of food technology.² Why? Refrigerators (and refrigeration) are unquestionably essential for food supply, security and safety in the modern world: an invention on which food markets and consumers are ever more reliant. Today’s refrigerated cold chain – responsible for moving foodstuffs from source to destination – is usually so slick in operation that we do not generally notice its operation until something goes wrong. The potential impact of refrigerator failure was flagged up early on by a late-Victorian fear of the catastrophic food shortages which might be triggered by ice famines. Urban populations had grown used to a supply of ice to help safeguard their food supplies, so any shortages were keenly feared and felt. Nowadays it only takes a hot spell – for me, a recent visit to my local supermarket where the refrigerator had packed up in a heatwave, its shelves completely cleared of milk and dairy produce – or a power cut and a return home to find packets of defrosted chips and a sodden floor, to be reminded that this is a fragile, complex chain that causes at best an inconvenience when it fails.

English Electric refrigerators being checked on the production line, 1954, taken by the famous post-war industrial photographer Walter Nurnberg.

The humble domestic refrigerator forms the vital user-end of the refrigerated cold chain. It is also the form with which we are most familiar today: an innocuous white box used to store food and drink, sitting in an uncontested space in the kitchen. Uncontested, because we do not question its place there, what to put in it or whether its utility justifies the initial expense and ongoing running costs. Neither do we doubt its necessity, seeing it as an essential preserver of food and human health. This standpoint is a relatively new departure, however. It is only in the last fifty years or so in the UK and Europe (the last eighty years in the USA) that the refrigerator has been accepted as an indispensable part of a well-equipped kitchen, eventually earning it the more familiar colloquial name ‘fridge’.³ In fact the refrigerator is such a commonplace appliance that defining it as ‘an appliance or compartment which is artificially kept cool and used to store food and drink’, as the Oxford Dictionaries website does, feels superfluous.⁴ But the general consensus of what a refrigerator is has evolved over time. A broader, less time-bounded definition includes all manner of boxes, rooms and cabinets used to keep food, drink and other substances cool, their prime refrigerating function driven by mechanical means or, in earlier times, ice. This is reflected in the vast array of appliances and objects described in the past and present as refrigerators or serving that purpose. In the home, for example, ice caves, iceboxes, ice safes, closets and chests and modern minibars and ice coolers are all in effect refrigerators. On a larger scale, traditional ice wells and icehouses function as refrigerators, alongside powered refrigerated trucks, cars, carts and shipping containers. A glance at a thesaurus finds the following listed in rough chronological order between the seventeenth and twentieth centuries: ice chamber, cool chamber, ice chest, freezer, refrigerator (in the seventeenth century as something that cools, in the early nineteenth century as a cabinet for keeping food cool), chill-room, coldstore, cool store, fridge (1926) and deep-freeze (1941).

While the main focus of the book is the domestic refrigerator, these machines form only the visible tip of the refrigeration iceberg. As chapters One and Two reveal, peer beneath that innocuous white surface and a thought-provoking back (his)story emerges. The scientific, technological and cultural threads woven into the development of the food cold chain and underpinning

modern refrigerator use are fascinating. The logistics of harvesting and transporting natural ice, the scientific exploration of cold and low temperatures, and, later, the messy emergence of the mechanical capability to produce artificial cold and the development of the cold chain – all took leaps of faith, imagination and intellect, with occasional added dashes of showmanship from their protagonists. The resultant refrigeration technologies – essentially a completely new method of preserving and transporting all manner of perishable goods – impacted spectacularly on society from the nineteenth century onwards. The development of these technologies has seen flurried periods of activity over the past 250 years, as societies adapted and responded to the challenges and opportunities refrigerators presented. But once this Pandora's box was opened, cooling foodstuffs at source, in transit and at far-flung destinations became increasingly the norm. This expanding refrigerated cold chain (growing in terms of both geographical reach and the sheer mass of goods transported) enabled local produce and goods to travel the world. It's no exaggeration to say that the nineteenth and twentieth centuries were refrigerated centuries, with twenty-first-century living set to intensify this trend. That the TV science presenter and comedian Alton Brown could, with relative nonchalance, pronounce the desire to make one, shows just how commonplace refrigeration has become in the modern era.

Despite this, and as chapters Three and Four show, the domestic refrigerator remained a tagged-on addition to the modern cold chain until relatively recently. As such it came late to the party. It may surprise many today but although domestic machines gradually found their way into the home, this was a far from easy or uncontested introduction. Twentieth-century refrigerator manufacturers gradually developed and finessed the domestic machine to make it a practicable and affordable appliance fit for the home. It solved the problem of what to do with foodstuffs when they arrived at their destination in the home better than the icebox had done. The refrigerator's success also owed a great deal to the accompanying advertising strategies of these manufacturers, who were desperate to secure themselves a share of a highly competitive market. Perceptions of refrigerator ownership shifted over the first half of the twentieth century from its being a machine which had fashionable

novelty status (to borrow from *The Electrical Age* magazine of 1932), through a desirable asset, to an expected item and now a virtual necessity within the home in many parts of the world. But as Chapter Four reveals, however well designed refrigerators are, they also have to fit into real kitchens and real lives. The story of fridge adoption into twentieth-century kitchens is one of gradual acceptance – refrigerators initially vying for space or co-existing with the more familiar icebox or traditional larder. Over time, as the public's acceptance of the necessity of refrigerators within the home grew, the domestic machine began to be planned into new build houses rather than simply tagged on to the existing list of kitchen appliances. Their huge impact on everyday life is also embodied by their permeation into popular culture. Refrigerators feature in books, iconic films and everyday soap operas. This impact is also evident in the extent to which they have been both anthropomorphized and sentimentalized, a reflection of their (now) long-standing place within the home.

The introduction of the refrigerator also brought with it an array of sometimes surprising features. Chapter Five examines why and how some of these developed. Many features, such as the noises generated by modern machines, were the particular result of refrigerator design decisions or manufacturing process. While many components are now commonly viewed as essential parts of a standard refrigerator, others have not stood the test of time. Can you imagine a refrigerator without shelves in the door or without its glossy external finish, for example? Have you ever wondered why refrigerators don't have foot pedals fitted to enable hands-free opening?

Of course, the domestic refrigerator's primary purpose is to store and preserve food and drink. Chapter Six considers how the machine has impacted on food consumption habits, diets and cooking in general. In the modern world, our domestic refrigerators are food hubs: the nexus from which we plan our meals, store foods and focus our food consumption. The refrigerator has made itself indispensable to modern lives and eating habits, with our dependency on them growing inexorably.⁵ In the mid-twentieth century the domestic refrigerator also instigated a completely new culinary practice: 'cold cookery', which sought to use both conventional and more exotic ingredients to cook with cold in a mixture of practical and complex recipes. As

such it trod a fine line between competing tendencies to make refrigerator ownership more desirable while potentially alienating a proportion of consumers, who were using refrigerators to store the daily pint of milk and not much more. Despite this, a strong cohort of manufacturers, backed up by high-profile cookery authors, promoted cold cookery as being symbolic of the notion of the domestic refrigerator as a modern democratizing force within the home.

There are incontrovertible benefits of refrigerator ownership to modern diets. They enable us to gather a harvest of foodstuffs into the home, the like of which is unprecedented in human experience in terms of both the variety and sheer abundance of foodstuffs stored. Despite this, refrigerators are not solely a force for good. They are, as Chapter Seven explores, a Janus-faced appliance with the potential to do both great good and great harm. Touted as essential to safeguard health, their use or misuse carries inherent risks and dangers at both the more intimate human and global scales. They can keep food fresher for longer, while conversely in some instances enabling the spread of dangerous outbreaks of food poisoning. Their physical form also carries its own dangers. Early, less safety-conscious, models carried the risk of death by entrapment, while the risk of CFCs to the global climate is perhaps one of the best-known parables in modern environmental history.

Finally, Chapter Eight raises the gaze back upwards and outwards again from the domestic machine to the wider world. It shows that refrigerators appear in unexpected places, used for surprising and unfamiliar purposes. They keep ice rink surfaces frozen, are used to regulate the temperature in vast refrigerated shipping containers and keep medical samples and vaccines cool. They also appear in startling and unfamiliar forms: from Persian desert walls, ice caves and earthenware vessels to refrigeration units within the world's largest structures and experiments. Refrigerator dreams pepper the machine's past and present, seeking to influence the imagined future of this machine.

The book encompasses tales of scientific discovery, applied technology, power and steam engines; ice harvesting, changing climate and the development of new markets for cold; the emergence of new foodstuffs, cooking methods and cuisine; glamorous cocktail parties and safeguarding the daily pint of

milk; housing design, post-Second World War recovery and political and social agendas; industrial design and production; spin-off refrigerator products using new materials; evolving domestic interiors and home cultures; increasingly globally connected food markets; art, self-expression, popular culture and taste; public health and hygiene; technological aversion, danger and even the odd dalliance with environmental catastrophe. These are partly told through the particular medium of the Science Museum's spectacular collection of objects, images and archives.⁶ If we are to fully understand our modern domestic refrigerator and appreciate its significance for our modern lives, we evidently need to scrutinize its origins and heritage. We need to start considerably further afield in both time and place from the average twenty-first-century kitchen.

1 THE ICEMAN COMETH

Stand in front of the refrigerator display in London's Science Museum and you will be surprised: alongside the familiar white good refrigerators, there are some more unfamiliar objects, including a large polished wooden Victorian box in the style of a heavily built cabinet, complete with polished brass hinges and handles and stubby wooden legs. If you were standing there alongside the average Victorian visitor, it is debatable which of you would guess what it is first. If they were a relatively wealthy Victorian, then they would have the upper hand, for this was not a household appliance for the poor.¹ They would describe its lined interior (often zinc or tin) and its thick walls stuffed with insulating material such as charcoal or cork. They would tell you that this was to protect contents from the external atmosphere and from pests. If you asked them what it was they would also tell you that this was a 'refrigerator'.² The key to its cooling powers lies in its alternative name: 'icebox'. Inside there is space for both a block of ice and shelving for foodstuffs – cooled by the regularly replenished supply of ice delivered by the iceman.³ No gas canister or electrical cable provided power for the refrigeration cycle inside this apparatus.

The simple ice block at the heart of the box, however, masks a complicated history. It is one that reveals how cold became a consumer good: a story in which one of the most significant outcomes is the modern powered domestic refrigerator. This is because the domestic refrigerator – in both original icebox form and the more familiar twenty-first-century powered equivalent



Early 20th-century icebox refrigerator, by the Seeger Refrigerator Co., St Paul, Minnesota.

Part of the refrigerator display at the Science Museum. The Seeger icebox can just be seen on the left-hand side.

– owes its existence to a gradually growing market and taste for ice and its cooling properties. This increased demand was aided and abetted by the growing sophistication and connectedness of an emerging food cold chain in the eighteenth and nineteenth centuries. With a cold chain broadly defined as a temperature-controlled supply chain, the food cold chain gradually linked cold storage from a good's place of origin to its final destination, with refrigerated stores and transport used along the journey: the aim being to extend the shelf life of foodstuffs and ensure their safety for consumption.⁴

TASTE FOR COLD

Ice and cold have long been valued both as welcome additions to recipes and drinks and as preservers of food. Ancient cultures, the Greeks, Romans and Chinese among them, cut and stored ice and used it to cool drinks. For example, the ancient Romans collected ice from nearby mountains, storing it in deep, covered straw-lined pits and selling it in snow shops in ancient Rome.⁵ The real *need* for refrigeration in most societies was very limited until recently. Because food was usually grown and consumed locally, ice was mainly used to preserve food where and when it was readily available for use. The Inuit use snow and ice to store their catches of game, while market traders in Yakutsk, the coldest city in the world, still sell their frozen fish direct from the ice. In Britain, as in many other places, the preservation of perishable food by cold (refrigeration) is a relatively modern and novel addition to the range of techniques used by households and communities seeking to eke out food supplies through the year and preserve gluts of food for leaner times.⁶

Only the extremely fortunate or wealthy had access to an icehouse, which were common in the grounds of palaces, chateaux and estates throughout Europe and among American Shakers by the seventeenth century. The modish British Royalist elite, returning home from Continental Europe after the restoration of the monarchy and succession of Charles II to the throne in 1660, were also building icehouses. They brought back with them a newly acquired taste for the novelty, excitement and pleasure of ice-cooled drinks acquired during their exile. These drinks provided a fashionable alternative to traditional English warm mead and ale and a welcome release after the puritan times of Oliver



Frontispiece to the first edition of Sprat's *History of the Royal Society of London* (1667). Francis Bacon is to the right of the bust of King Charles II. Bacon was instrumental in investigating refrigeration, his research producing a number of refrigerating mixtures.

Cromwell's England. These social elites were following the lead of Charles himself, who built icehouses in London's Upper St James's Park (now Green Park) that supplied ice in summer for his guests.⁷ Charles was also very supportive of the newly formed Royal Society, which was bringing a new vigour to science at the time and developing the scientific method formulated by Francis Bacon to explore natural phenomena, including hot and cold.⁸

By the eighteenth century there was an entrenched and growing taste and desire for ice among the fashionable elite, who cooled their drinks in imitation of the king's 'royal cup'. The demand for ice was beginning to filter down the social chain, with contemporaries viewing it as a fashionable, if rather pricey, commodity. Cookbook authors and diary keepers increasingly mention the use of ice to cool food and drink. Hannah Glasse's popular 1751 cookbook *The Art of Cookery* describes using it to surround and freeze a 'bason' containing a mixture of raspberries

and cream.⁹ Glasse's book was a best-seller in Britain for over a century. Although it was intended as an instruction book for servants, it was purchased by the lady of the house. Showing considerable business acumen, Glasse chose to sell it in toy and china shops, which ladies were apparently more likely to visit than bookshops. Jane Austen, in a letter to her sister Cassandra in 1808, expressed a wish for expensive foodstuffs, and to 'eat Ice and drink French wine, and be above vulgar Economy'.¹⁰

Despite the fashionableness and desirability of ice in eighteenth-century England, there was not yet a huge demand for it. Whether stored in specially commissioned icehouses in architecturally sophisticated Gothic or Palladian style,¹¹ in simpler functional ice caves on country estates, in city ice stores or in private ice wells, cultivating, preserving and harvesting a supply of ice was a big undertaking. Icehouses required a colossal investment of time and money – both to build and to maintain.¹²

The diarist John Evelyn (travelling companion of the Royal Society founding member and icehouse poem writer Edmund Waller) wrote one of the most famous descriptions of an icehouse.¹³ He described the construction of a seventeenth-century Italian 'snow pit' in some detail, as a straw-lined funnel-shaped pit, which was filled with layers of beaten snow 1 foot thick, alternating with more layers of straw. There was usually a drainage ditch or a tap to drain off the melted water.¹⁴ Two hundred years later and commercial ice-harvesting companies in America and at London's dockside stores were using icehouses of monumental size. The sophistication of their increasingly mechanized operation prompted detailed descriptions in the populist press of such 'spacious dungeons', in which 'old King Frost is cooped a close prisoner'.¹⁵ From the store ice made its way all around the country, with railway vans being packed with ice for the 'country trade'.¹⁶

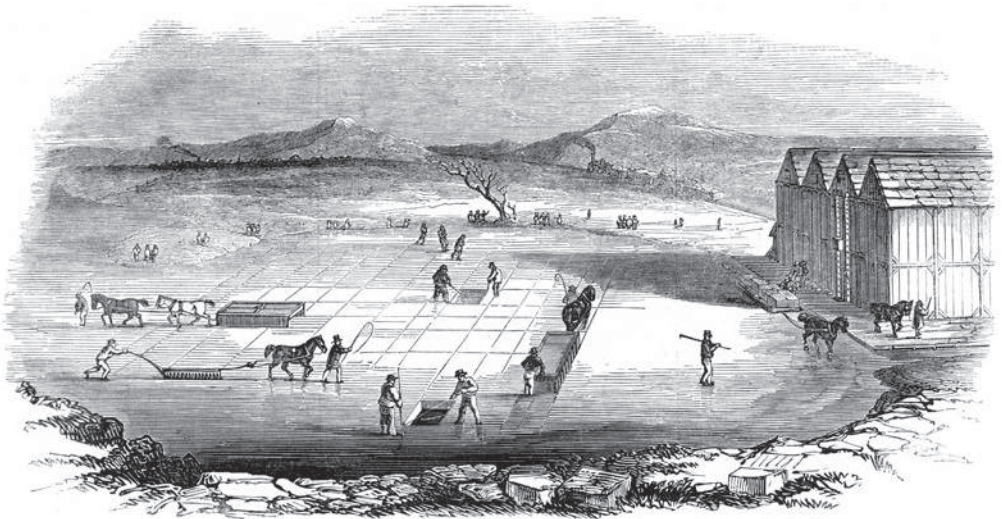
COMMERCIALIZING COLD

There was no need for or conception of a cold chain moving supplies of refrigerating, preserving ice over long distances from place to place in eighteenth-century Britain. Ice was locally 'cultivated' and harvested in 'occasional and fitful' quantities.¹⁷ The climate was colder then, as Europe found itself in the midst of the Little Ice Age, which lasted well into the nineteenth century.¹⁸

By the mid-nineteenth century the situation had changed dramatically. Visionary entrepreneurs like the Bostonian ‘Ice King’ Frederic Tudor were harvesting ice in America and Norway and shipping it around the world. Tudor arguably devised the first cold chain,¹⁹ setting up cold stores for his ice in destination ports (initially in Martinique and eventually Mumbai (Bombay), Havana and Kolkata (Calcutta), among other places).²⁰ Against all the odds and against strongly held initial contemporary scepticism about such a ‘slippery speculation’, ice shipments took off. Tudor’s company alone shipped 130 tons in 1806 and 146,000 tons (over a thousand times as much) fifty years later.²¹

In June 1822 the first import of 300 tons of Norwegian ice arrived in Britain.²² The shipment was so unusual that the ice had melted away by the time customs officers decided how to categorize it (eventually settling on ‘dry goods’). In 1844 the Wenham Lake Ice Company (one of the most well-known exporters of American ice) sent over their first shipment of ice to Britain, a journey of nearly 5,000 kilometres (3,107 miles) all the way from Wenham Lake, Massachusetts, to London. The company’s shrewd marketing strategy was to put a seemingly imperishable ‘massive specimen’²³ of their pure ice on permanent display in the window of their high-profile main office at number 40 The Strand with a newspaper behind it so that people could see how clear it was.²⁴ In an extraordinary example of nineteenth-century branding, Lake Opegård in Norway was renamed Lake

Ice harvesting at Wenham Lake, c. 1845, from the *Illustrated London News*. The lake was fed by springs, reportedly accounting for the clarity of the ice produced. The ice stores on the right could hold 20,000 tons of cut ice blocks, some of which eventually made its way across the Atlantic to London.



Wenham by the Norwegians after its original American counterpart to cash in on its popularity and reputation for purity and clarity. By 1860 much of the ice consumed in the UK came from Norway, often cut in springtime from coastal areas.

Ice was firmly accepted as a desirable consumable good by mid-nineteenth-century contemporaries. One thoughtful article in the *Illustrated London News* pursued a line of reasoning that will feel very familiar to anyone currently reflecting on our present-day consumer culture. The ‘artificial wants’ created by civilization had ‘originated a strange and endless variety of trades and professions . . . to produce articles which, a few generations since, had no existence, but which have now become absolute necessities of everyday life’.²⁵

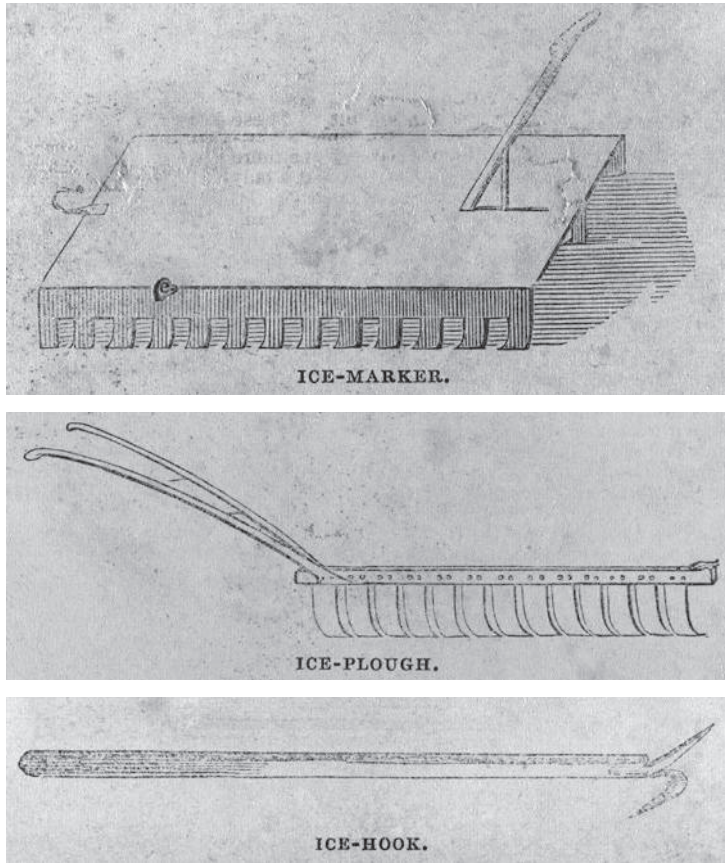
Harvested ice punctured the very heart of nineteenth-century London, loaded onto barges and moved along arteries like the Regent’s Canal to ice wharves and from there to ice wells. Two huge ice wells (each about 30 feet (9.1 metres) across and 42 feet (12.8 metres) deep) were built near King’s Cross by the famous London iceman Carlo Gatti in 1857 and 1862. Imported and locally harvested ice kept them well stocked.²⁶ Local harvesting, although relatively unsophisticated, occurred on a big scale. One London reporter claimed to have ‘seen at one well in St. John’s-Wood, a string of sixty or seventy carts waiting to discharge their loads’.²⁷ From these wells, or ‘shades’, worked by lamplight in the extreme cold, icemen delivered ice to homes and businesses across London.

The sheer time and resources needed to harvest the ice – whether scraped from ponds or carved out of American lakes in huge chunks – partly explains its value.²⁸ The mixture of contemporary agricultural and mining rhetoric and symbolism surrounding the industry reflect this preciousness. Ice was ‘nurtured’, ‘cultivated’, skimmed to remove loose snow and ‘reaped’ at the right time (once the optimum thickness had been reached), just as you would do with any other valuable agricultural produce.²⁹ Descriptions of the ice itself were also mineralogical. Ice as glittering ‘Arctic crystal’ was a valuable commodity: a treasure to be mined and coveted.³⁰ Ice harvesting equipment also adopts this rhetoric, with horse-drawn ice markers and ice-ploughs used to mark out the blocks churning up ‘glittering dust’ as they go.³¹ Ice saws hacked out the blocks



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Engravings of various pieces of specialist ice-cutting and harvesting equipment from the mid-19th century. The scale of the equipment can be seen in the Wenham Lake ice harvesting image on p. 18.



This illustration, 'London Ice Carts', from the *Illustrated London News* in 1850, presents the scene at a London pond with a heady mixture of pathos and comic caricature. A tired, thin-looking horse wearily pulls a heavily laden cart full of shards of ice, while a series of cold, raggedy characters accompany it.

Farming natural ice in Norway, c. 1900, showing the ice scored and ready for cutting.

and ice picks and hooks moved the floating blocks to ice elevators and up into icehouse storage.³² Such specialized equipment revolutionized ice harvesting, making it easier and faster and enabling workers to cut and manipulate 2 cwt blocks of ice each from frozen lake to icehouse with relative ease.³³ Leaving the ice too long was a risky business, as it was 'liable to perish by change of weather, even more quickly than grain'.³⁴

The ice's pureness was a key selling point. The Wenham Lake Ice Company courted both publicity and notable patrons, sending a sizable lump of ice to Queen Victoria at Windsor and going on to supply the Royal Household in the 1840s.³⁵ Writers enthused while adverts indulged in excitable sales patter about the beauty, clarity and cleanliness of their ice.³⁶ The cookbook author who gushingly recommended its use for Mint Juleps and Sherry Cobblers because of its 'extreme purity' and 'crystalline brilliancy' was far from alone.³⁷ What could be more beautiful

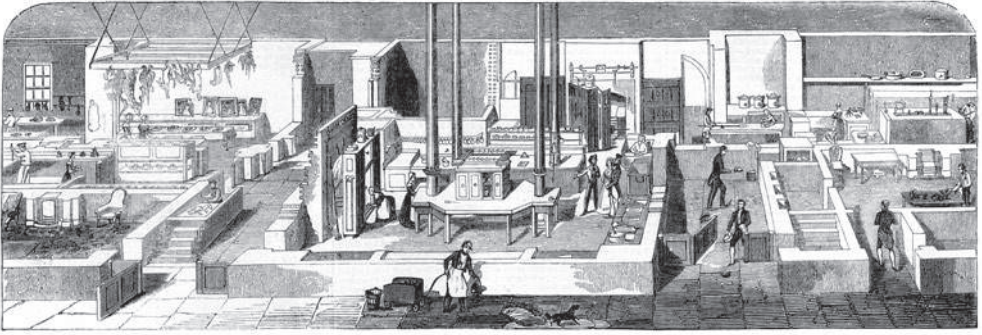
REFRIGERATOR



Blocks of ice being guided to the icehouse elevator, Keystone View Company, Conneaut Lake, Pennsylvania, 1907.

or refreshing in the ‘heat of summer’, another writer said, than ‘pure fragments of crystal Ice, which glitter here and there like huge diamonds’?³⁸

By mid-century ice was in demand everywhere. Wenham sold events such as a ‘Grand Bal Masqué’, organized by the popular and extremely flamboyant composer Louis Jullien for ‘families of distinction’.³⁹ Highlights included fashionable new waltzes composed for Queen Victoria, coffee, tea, ice creams and Sherbet Carrara Water, ‘kept in Wenham-lake ice’.⁴⁰ Jullien’s famous friend the celebrity chef Alexis Soyer also had ice supplied to his new kitchen at the Reform Club in London in the early 1840s.⁴¹ The rich and famous flocked to see the ‘mysteries of science’ displayed in what was described as a private exhibition or temple of culinary art and technology. Soyer, ever the showman, directed proceedings from the centre of the room. He was able to control temperature via a vast range of novel appliances, including gas ovens and a suite of ice-cooled storage. It was arguably the most technologically advanced kitchen of the time, with refrigerated meat safes, lead-lined drawers or



The Reform Club kitchen, c. 1842. The cap-wearing Soyer shows admiring visitors around. Refrigerated cabinets can be seen in the back left of the kitchen.

‘ice preservers’ to keep prepared dishes fresh and an ice-lined dresser for jellies and ice creams. Soyer used icebox refrigerators not just to store ingredients but to make dishes and preserve his creations – a sign of things to come. However, at the time Soyer’s ice-hungry refrigerators were part of a dream kitchen that few people could afford.

Most domestic (icebox) refrigerators sold as a spin-off product of the ice industry. By the 1840s iceboxes were newsworthy in Britain. One columnist for *The Times* boldly stated that ‘American Refrigerators’ (most were imported American models at the time) were indispensable in the home, keeping meat, fish and butter ‘sweet for weeks’ for the price of a ‘few pounds of ice’.⁴² Canny ice companies like Wenham sold them as ‘portable refrigerators’,⁴³ alongside the ice that would supply the household with ‘cold’. For early adopters, cold chain infrastructure had reached the home. British newspaper readers were told of their supposed ubiquity across the Atlantic where every American family has a “‘Refrigerator”, or portable Ice-house’.⁴⁴

It is hard to get a sense of just how widespread their use was in the late Victorian era. Some contemporary guides for servants and household managers certainly refer to them as evidently expected parts of the kitchen equipage. While Mrs Beeton’s classic *Book of Household Management* only refers to a ‘refrigerator’ once in the 1861 edition (with a passing mention to its use for storing fruit), by 1907 the revised version contained ten references, including a detailed description of what a refrigerator is and how to choose a decent and well-insulated one.⁴⁵ Ethel Peyser’s 1922 manual for New York urban living, *Cheating the Junk-pile*, contains no fewer than 93 references to ‘refrigerator’, suggesting that a refrigerator and a supply of ice in general

REFRIGERATOR



Small (icebox) refrigerator from the late 19th or early 20th century. There would be very little room for foodstuffs once the ice had been installed.

was viewed as invaluable in the early twentieth-century home.⁴⁶ No wonder then that any mention of a potential ice shortage perturbed urban populations.

Even scarcer are descriptions of what icebox refrigerators were like to use. Fortunately, there are more recent descriptions that give a flavour of what it must have been like to rely on their cooling powers. Sarah and Gabriel Chrisman are conducting an ongoing historical research project by living as a late Victorian couple, surrounded by the appropriate technology – refrigerator included. The icebox they use is fairly modest in size and design, with a drip tray at the bottom. Using it has given them particular insights far past the gloss of contemporary advertisements to hint at how it would have been to use one in Victorian times. In their community of Port Townsend, Washington, ice deliveries were

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commonplace in the 1880 and after, when deliveries by strong icemen led to bawdy jokes paralleled by those about milkmen in more recent times. Sarah and Gabriel stock their refrigerator with chunks of ice weighing approximately 60 lb (27 kg).⁴⁷ Use has taught them that the best method of storing meat and milk is to place it directly on the ice. Its use necessitates regular emptying of the drip tray and the adaption to a new sound – that of melting ice crashing to the bottom of the box at unpredictable intervals – added to the household’s soundscape. Their experience has suggested that their food supplies are actually kept colder than they were in their previous electric refrigerator.⁴⁸

While their staying power as a useful household appliance was as yet untested, icebox refrigeration and the cold chain were well and truly inculcated into British Victorian culture and society, if not mainstream everyday life, by the late nineteenth century. The increasing number of cultural references made to them reflects this. Wenham ice appeared in Rudyard Kipling’s *Second Jungle Book* stories, swallowed unexpectedly by an Indian adjutant bird thrown a large piece by mischievous boatmen. Never having experienced ice before, the bird described being ‘afflicted by an excessive cold’ running down to the ‘extreme end of my toes’ and was very surprised by the fact that it

The interior of Sarah and Gabriel’s refrigerator, showing ice blocks stacked and melting away, and their refrigerator, its flat top used to store general kitchen equipment.



disappeared into nothing. Fifteen-year-old tomboy Jo March, the main protagonist in Louisa May Alcott's *Little Women*, set during the American Civil War, realizes with disgust that she has 'neglected to put the milk in the refrigerator'. One of Charles Dickens's characters – *Little Dorrit's* formidable Lord Lancaster Stiltstalking – was chillingly described as a 'noble refrigerator' whose countenance had 'iced' European courts, 'shaded the dinner', 'cooled the wines', 'chilled the gravy' and 'frozen the tea'.

In the 1850s Andrew Wynter viewed iceboxes as 'a shield that the arrows of Apollo cannot penetrate', presciently predicting that they would 'become as much a universal comfort among us as the bright fireside'. A quick flick through the encyclopaedic *Army and Navy Stores* shopping catalogue for 1907, produced sixty years later, reveals the huge range of iceboxes of varying degrees of sophistication and decoration and the related equipage that were available to the consumer by the early twentieth century.⁴⁹ Despite the varied names and forms, all were essentially icebox refrigerators. They included 'Kent's Patent Ventilated Refrigerator' – a zinc-lined 'Provision Preserver and Ice Chest'; Kent's 'Cold Store'⁵⁰ and a larger odourless 'Cold Store Room' version; Dry-air Cabinet Refrigerators; ice safes; Cabinettes; and tiled and polished oak models. Suitably named models such as the Alaska and the Snowdon emphasized their cooling function. There were also diverse related items including ice caves, ice-shaving machines, ice cream freezers, ice tongs, pails, bowls, moulds for cooking and hammers. At home, ice use had shifted from novelty and luxury to necessity, through stages of occasional use, to constant use 'in the kitchen, in the butler's pantry and on the table'.⁵¹ Nineteenth-century icebox refrigerators were, as it turned out, the unwitting trailblazers for their powered descendants.

Town and country alike increasingly relied upon cooling supplies of ice. While urban dwellers used their iceboxes to store fresh meat and milk as well as ice, iceboxes were literally life-savers in more remote areas where trips to town may not have been common and 'gluts' of seasonal produce needed to be preserved in any way possible. Unlike many, the American Madge Shriver's family were lucky – their icehouse, full of locally harvested ice, and home icebox were located close to each other.⁵² The upshot is that from the mid-nineteenth century people were



Boys licking large blocks of ice to cool down on a hot New York day, 1913.

becoming increasingly reliant upon supplies of cooling ice for their homes and food chains, despite the growing numbers living further away from the source. In America, disruption of the ice trade between Boston and the South in the 1860s during the American Civil War and a series of warm-winter-induced ice shortages later in the century shook any complacency people felt in the constant supply of ice.⁵³ In rapidly growing cities, producing, importing and distributing enough food and keeping it cool was particularly problematic. The naming of these shortages as ‘ice famines’ highlights their potential seriousness. In the hot summer of 1894, a Michigan newspaper reported that Chicago only had one day’s supply of ice left, fearing the consequent fallout: ‘An ice famine is imminent, and is . . . more serious even than the threatened famine in fruits, vegetables, butter, eggs . . . Every business house that uses ice, as well as every home, is threatened with total deprivation by tonight.’⁵⁴ Coverage of another famine in New York, resulting in inflated ice and food prices, brought the fear that ‘poor people probably will have a disastrous summer.’⁵⁵ The unreliability of the railway system used to transport the ice, hot weather, ever-increasing demand and

resultant rising prices also caused ice famines. Neither were they restricted to nineteenth-century urban America. Calcutta and Bombay both experienced shortages in the mid-nineteenth century, when shipments of imported ice failed to arrive on time. In London there were ice famines in 1898 and 1899, caused by particularly hot summers, with supplies sought from further afield in Finland.⁵⁶ Similarly, during the First World War, both artificial and natural ice was in short supply in Britain, with most of the available ammonia being used for ammunitions factories. These famines brought into sharp relief the precariousness of relying on ice-cooled refrigeration to keep food supplies cold. It was time to find a better way of ensuring the supply of ice and cold.

2 THE BIRTH OF COOL

Refrigeration . . . is simply a process of removing heat. Heat in itself . . . is not matter, but rather a condition of matter.
British Electrical Development Association, *Electric Domestic Refrigerator Handbook: A Guide to Practical Maintenance* (1952)¹

By the late nineteenth century the supply of natural ice in Britain and elsewhere could no longer keep up with demand.² As reliance upon natural ice grew it was increasingly obvious that a practical way to make it artificially needed to be found to avoid shipping such a troublesome, perishable and heavy cargo in some cases literally halfway around the world. Between the sixteenth and the nineteenth century most of the scientific and technological advances key to developing refrigerators messily and gradually fell into place.³ It would be convenient to be able to say that there was a grand narrative of scientific discoveries and technological developments leading up to the inevitable invention of the refrigerator as the ‘concluding’ chapter, but this wasn’t the case. Early refrigeration models were more at home in a science lab and were far removed from the form taken by the familiar home machine today. Scientists and engineers variously dabbled or experimented more seriously, making real advances in the science and technology of refrigeration.

Most of the experimentation took place in North America, Australasia and Western Europe. In Europe research into refrigeration was particularly strong in Great Britain, France, Germany and Switzerland. Those regions keener to research the

production of cold and, later, develop refrigerators, were usually those where there was a shortage of natural ice or, in the case of Australia, where there was a desire to find ways to export their produce. The work of many professional and amateur scientists, engineers and entrepreneurs contributed to develop the three key areas needed to produce working refrigerators: increasing understanding of the underpinning science of heat, temperature and the behaviour of gases; developing the refrigerant gases needed to carry away heat; and creating a repeated cycle of cooling (rather than a 'one shot' approach in which the coolant was lost), vital to creating useful refrigerators.

However, despite long traditions in exploring both the science and technology of 'creating cold', these two strands were largely explored separately until the mid-nineteenth century.⁴ Michael Faraday discovered refrigerants in his attempts to liquefy gases, but didn't apply the science to produce a refrigerating machine. Nicolas Carnot, James Joule and William Thomson (Lord Kelvin) are only a few of the many well-known scientific names who helped develop a more sophisticated and accurate understanding of the laws of thermodynamics and energy and heat transfer between matter. Similarly, a string of engineers including Jacob Perkins and Richard Trevithick helped develop the mechanics of steam power and the idea of a continual cooling cycle that enabled powered refrigeration to be finessed.⁵ It also was not the case that those developing the technology always understood the underpinning science or that those exploring the science were interested in its potential utility. It is telling that early experiments in creating cold were often seen as supernatural in nature. When the alchemist Cornelius Drebbel pulled off the feat of chilling the court of James I, probably using a cooling salt mixture, he certainly did not understand that cold is simply the absence of heat, rather than being a thing in itself. It says much about contemporary perceptions of scientific enquiry and the black arts at the time that Drebbel was also the court magician.⁶ Similarly, many of those headlining the list of inventors of mechanical refrigeration in the early nineteenth century (including Jacob Perkins and Oliver Evans) *were* building ice-producing machines. However, they did not yet have an understanding of the underlying laws of thermodynamics or gas laws, which had yet to be formulated, unpicked and explained,

or any of the more useful refrigerants such as ammonia, which had yet to be liquefied and prove its worth as a refrigerant within a cycle of cooling.

Even with scientific theory becoming more firmly embedded into engineering practice, mechanical refrigerators remained largely experimental well into the mid-nineteenth century. This is not, however, the book to outline all the myriad scientific experiments and technological developments that contributed to the development of the refrigerator. Other writers have already done it and done it well.⁷ But one way or another by the late nineteenth century all of these science and technology jigsaw pieces, nudged by a growing need for cold from the consumer and industry, had come together to make refrigerators both imaginable and practicable.

EXHIBITING COLD

The time period in which many of the most important developments in producing practical, working, commercial (and later domestic) refrigerators occurred is framed by two important exhibitions, both centred on South Kensington, London. A marker of this is the glut of refrigeration-related patents applied for throughout the period, with hundreds of mechanical refrigerating machines being patented between the 1830s and the 1930s.⁸ So many patents were filed in early 1930s Britain that the Science Museum put together a book listing them.⁹ The first exhibition was the International Exhibition of 1862, at which prime examples of the two types of refrigeration technology that encapsulated artificial refrigeration's trajectory and future promise were displayed. The second, seventy years later, was the Refrigeration Exhibition of 1934 held in the Science Museum just up Exhibition Road and towards Hyde Park, within throwing distance of the 1862 exhibition site. By 1934 domestic refrigerators using the very same technologies on show in 1862 were in production.

If you visited London in 1862, you might well have travelled there especially for the International Exhibition of that year – the successor to the now better-known Great Exhibition of 1851.¹⁰ It was built on a 23-acre site in the gardens of the Royal Horticultural Society, South Kensington – the present-day site of the Natural History and Science museums. An impressive



6.1 million people passed through its doors between May and October that year. This is more than visited the 1851 Great Exhibition and was equivalent to roughly one-third of the population of England and Wales at the time. They went to view the assembled artistic and industrial works and inventions of more than 28,000 exhibitors from around the world. The ‘carrot’ of such high visitor numbers in a high-profile exhibition drew many who were keen to drum up interest (and financial backing) for their ideas, and exhibitions such as this were a proving ground for many inventions. Like the earlier shopfront displays of Wenham Lake ice, both exhibitions were public spectacles, intended by exhibitors to sell ideas and machines and to educate and enlighten the general public.

Travelling west from the main exhibition entrance on Cromwell Road you would have eventually reached the ‘Machinery in Motion’ section in the western annexe. Nestled within this was a small grouping called ‘Ice and Soda Water’, formed of a mere handful of machines. The focus of much of this machinery – as the group name suggests – was firmly on the relatively new art of artificial ice production rather than refrigeration per se, but in essence these machines displayed refrigeration techniques and technologies. The group included a new vapour compression ice-making machine exhibited by Daniel Siebe of the engineering firm Siebe Brothers of Lambeth, London; an improved version of James Harrison’s patent ice-making machine – number 1986 in the official exhibition catalogue.

The 1862 International Exhibition building in Cromwell Road, South Kensington. This chromolithograph by the Leighton brothers was published in a special supplement of the *Illustrated London News*.

Slightly to the west and almost within sight of the Siebe-Harrison machine was another: Ferdinand Carré's 'Machine for making ice' (number 1191 in the catalogue and high-profile enough to be marked on the plan as 'ICE MACHINE CARRE'). This used a gas absorption cycle driven by heat rather than a mechanical steam engine to produce its refrigerating, ice-making effect. The technology used by these two machines was to set the example for those that followed, with the refrigeration processes they demonstrated largely dominating refrigerator development for the rest of the nineteenth and twentieth centuries.

The Siebe-Harrison machine displayed at the 1862 International Exhibition came about after Harrison had been granted a number of patents for closed system refrigeration in the 1850s. Harrison, an engineer, businessman and journalist, had originally moved from Scotland to Sydney, Australia, in 1837 where he developed his ideas on refrigeration. A vapour compression ice-making machine made by the prolific American inventor and engineer Jacob Perkins inspired him.¹¹ Perkins's real breakthrough – one that Harrison recognized as significant – was in making a closed-circuit machine in which the refrigerant was circulated (compressed, condensed and expanded in turn) and reused, just as it is in domestic refrigerators today. This was absolutely vital for the future success of refrigerators.¹² Earlier 'one shot' machines extravagantly lost their refrigerant from the cooling cycle. But inventing a practical machine and running it as a successful commercial venture did not always go hand in hand. Perkins's machinery was expensive to run, and as yet unable to compete with the cost of shipments of harvested natural ice.

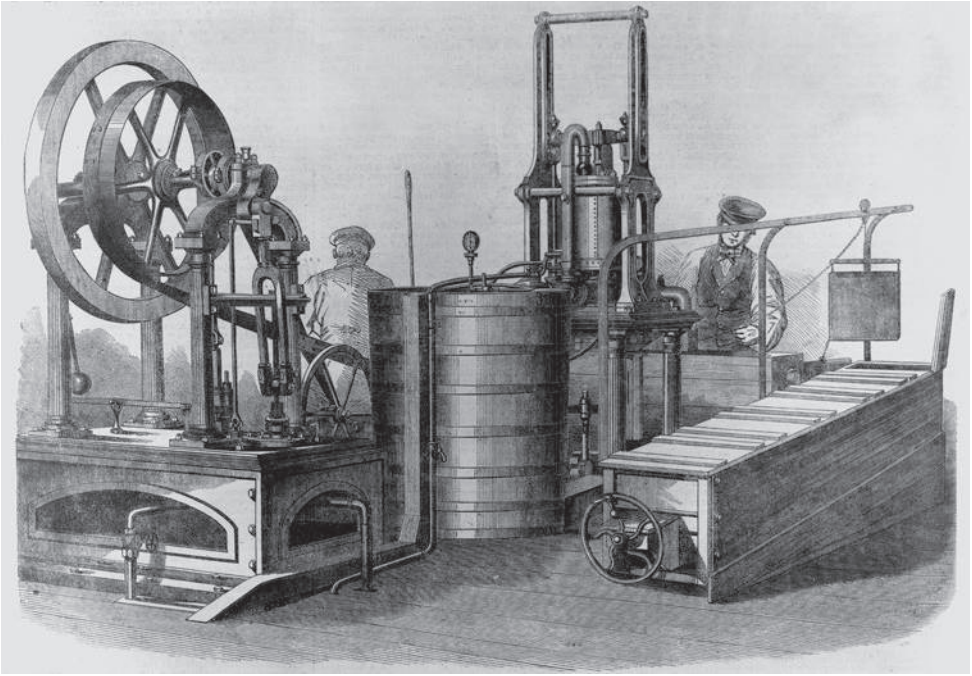
Harrison had a visionary sense of what his invention could be used for. He foresaw a real market for artificial ice in Australia in particular, where natural ice is rare.¹³ He was also among a number of engineers who anticipated the value of refrigerators not just for cooling buildings and manufacturing processes such as brewing, but for the refrigerated transportation of food from place to place.¹⁴ In the late 1850s, realizing that he needed some hardcore engineering expertise to develop his machine, he sought out the help of London-based Siebe Brothers. This family firm had great engineering heritage and prowess. Daniel Siebe worked with Harrison to tweak his design and, evidently happy with the new machine, set it up for display and for testing at No. 4



Red Lion Square, London, in 1858. It garnered press coverage and even a visit from Michael Faraday – no stranger to theatrical scientific demonstrations himself.¹⁵ Over a number of years, various sizes of these machines from one-half horsepower to ten horsepower were displayed and demonstrated in London, Vienna, Paris and Australia.¹⁶ The ‘improved’ machine displayed by Daniel Siebe in the 1862 exhibition won exhibition medals.

Both the press and the encyclopaedia published to accompany the 1862 International Exhibition described the machine in great detail. The Siebe-Harrison machine followed Jacob Perkins’s idea in developing a system of cooling in a closed cycle, alternately evaporating (under vacuum) and condensing a gas refrigerant (ether in the case of the Siebe-Harrison machine) to transport heat away from the material needing cooling. A cylinder in the centre of the equipment used a valve to control the release of cold ether vapour from the evaporating vessel into the condensing vessel. The vapour released ‘produced’ cold, which was carried in a stream of salt water to a trough (called a ‘refrigerator’) containing a series of gun-metal moulds of fresh water. The surrounding stream of cold salt water froze the water into ice. Both the ether and saline were then circulated (in what the newspaper describes as ‘bearing a remote resemblance to the double circulation of the blood’), releasing their heat and being

James Harrison, Scottish pioneer of refrigeration, photographed c. 1870.



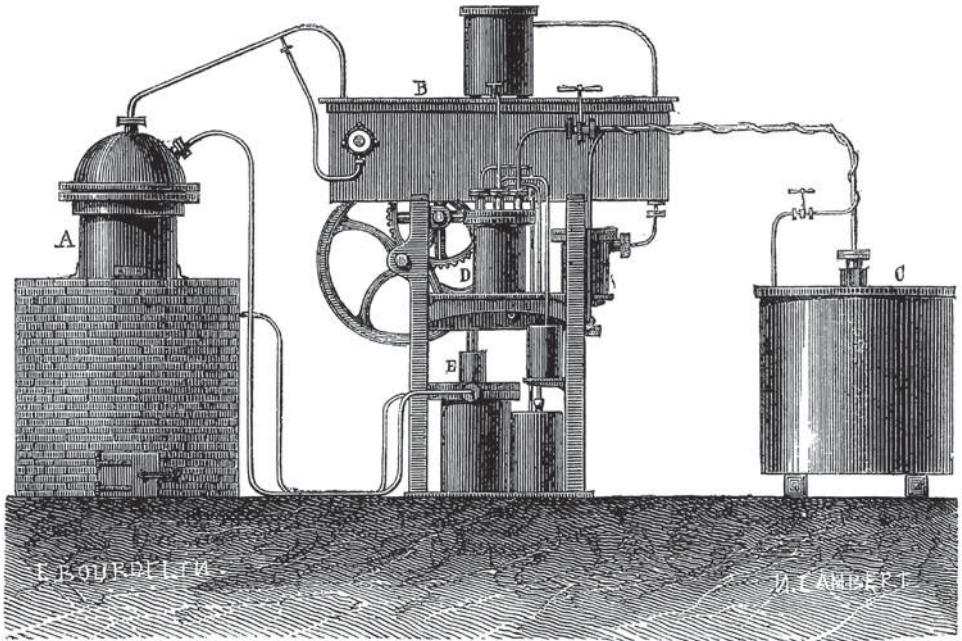
Siebe's improved Harrison-patented ice-making machine at the 1862 International Exhibition. This image appeared in the *Illustrated London News*.

cooled, and the ether compressed and condensed, to start the process all over again.¹⁷

The largest Siebe-Harrison machine available in 1862 produced ten tons of ice per day.¹⁸ Little wonder perhaps that many of the large commercial ice factories of the late nineteenth century relied on this method. Both Harrison and the Siebe Brothers (later Siebe and Gorman) evidently carried on developing machines and applied for a number of refrigerator patents in later years.¹⁹ Improvements and refinements would eventually make vapour compression refrigerators the most widely used kind throughout the late nineteenth and twentieth centuries.²⁰

Ferdinand Carré's ammonia absorption ice-making machines sat mere metres away, in a section displaying machines from all over the world.²¹ It is hard to believe that the two competitors did not take the opportunity to view each other's machines. Showing off his recent 1859 French patent, Carré's machines worked the same 'ice magic', but silently, relying on an ammonia boiler and the direct heat produced by a solid-fuel stove instead of the noisy, powered compression technology of Harrison's machine to drive the cooling effect that turned water to ice.²² This was the machine that inspired the invention of the

REFRIGERATOR



silent domestic Electrolux refrigerator over sixty years later. A later, similar machine made by Carré's brother Edmond to cool drinks – a science lab mixture of copper tubing, brass taps and wood – is still kept in the stores of the Science Museum.²³ Unlike the Siebe-Harrison machine, however, Carré displayed small versions of his machine designed for 'household' use alongside the larger ones. Perhaps celebrating its French heritage, the 'little machine' was advertised as cooling a bottle of champagne in ten minutes. The greatest danger was that leaving it too long would transform the 'sparkling contents of the bottle' into a 'spongy mass'.²⁴ Carré's large machines were suggested as useful for breweries, candle makers and any other businesses which were 'obliged to stop working during summer'.²⁵ More significantly, his machines were also smuggled through the Union blockade of southern states during the American Civil War, with the southern states producing artificial ice with abandon from then on.

Public demonstrations and exhibitions like the 1862 one were an opportunity for businesses and inventors to tout their wares. Demonstrations, exhibitions and the resultant newspaper reportage were crucial for anyone looking to secure funding for their invention in an era where knowledge dissemination was dominated by public events and print media. The *Illustrated London*

Ferdinand Carré's 'Machine for making ice by successive evaporations and liquefactions', as shown in volume III of the illustrated catalogue for the 1862 exhibition.

News regularly published accounts of scientific demonstrations. In 1847, for example, the paper reported on a demonstration by Messrs Lings and Keith at the Western Literary and Scientific Institution, at which they demonstrated the refrigerating principles behind their icebox. They produced preserved asparagus and strawberries as proof of the box's effectiveness in the 'production of cold'.²⁶ Their iceboxes were also on show at the 1862 exhibition, with an illustration in the accompanying catalogue.²⁷ The Siebe-Harrison and Carré machines provoked particular visitor interest. Among the regular visitors to the 'Machinery in Motion' section were 'Grave gentlemen' armed with well-thumbed catalogues and ladies who went to 'improve their minds'.²⁸ A bit of showmanship or a dramatic demonstration, together with a mildly sensationalist report such as the one that appeared in the *Illustrated London News* about the two machines at the 1862 exhibition, was all useful publicity. The newspaper plugged ice-making machines in general (and the Siebe-Harrison machine in particular) as one of the exhibition's highlights, in essence because of the sheer alchemical magic of the process of creating something cold using heat that the machine demonstrated. The deep fascination for the machine shown by both the general public and the more scientifically informed visitor alike was portrayed in newspaper reports:

Crowded as is the Western annexe with mechanical wonders we think that the machines for making ice take precedence of all of them in the eye of the general public . . . Visitors ignorant of science look on in amazement, while the learned, who know well enough about the theory, are equally surprised to see miniature icebergs rise up before their eyes, the results of the labours of a powerful steam engine and a quantity of very hot looking apparatus.²⁹

While there was evidently some scepticism about the processes involved, what a contrast there was between this breathlessly enthusiastic press reportage and the reaction provoked less than twenty years earlier in America by another well-known ice-making machine made by Dr John Gorrie. There was a thread of feeling at that time that viewed such experiments as 'unnatural' and against the will of God. Cutting natural 'God's

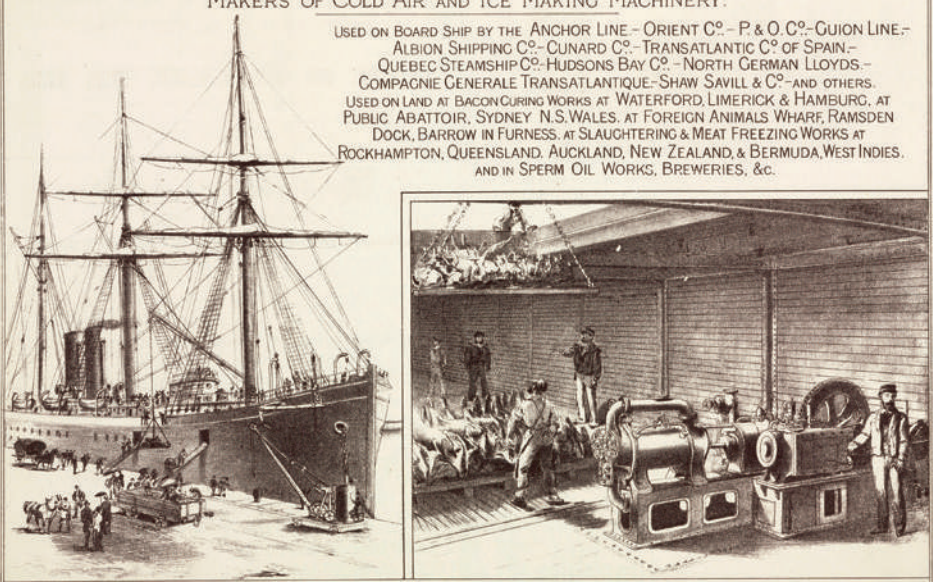
ice' was one thing,³⁰ but producing it artificially, as Gorrie did in an effort to find a way to help fever patients at his hospitals, was viewed as quite another. His machine prompted a mixture of cynicism, disbelief and a whiff of stage-managed disapproval on quasi-religious grounds, the most infamous outburst of which was published in the *New York Globe*, which castigated him as a 'crank' for claiming 'he can make ice as good as God Almighty!'³¹ While this disapproval of Gorrie's work was evidently played upon for effect, there was an underlying strand of Puritanism in both America and Europe throughout the nineteenth century that viewed some technological advances with unease and artificial ice-making as a 'God-provoking exercise'.³² Machines might 'steal their jobs and even their souls'.³³ However, outpourings of technophobia in Britain at the time were more likely to be couched in terms of the impact on the labour force, and the feared loss of employment and standardization of work practices, which the introduction of new machines and factories was most likely to engender. Avoidance of refrigerator technologies on religious grounds continues to this day within the Amish community in America. In the 1980s a dispute arose within the Clear Brook Amish community in Indiana over whether or not more technologically sophisticated kerosene refrigerators could be used instead of the sanctioned iceboxes.³⁴

Both the Siebe-Harrison and Carré machines were high-profile, partly because they were displayed just as interest in artificial refrigeration was beginning to gather momentum both among the public and in industry. While in retrospect the exhibition signalled a turning point for refrigeration, it was not Harrison or Carré but others following them who began to realize the potential of refrigerating machines. A raft of increasingly polished, powerful and sophisticated machines emerged in the late nineteenth century, in what was one of the most prolific and fruitful periods for refrigerator development. Relatively new companies such as the Bell-Coleman Mechanical Refrigeration Co. and Linde's Ice Machine Company (Gesellschaft für Lindes Eismaschinen Aktiengesellschaft) cut their teeth on refrigeration technology at this time,³⁵ as did more established engineering firms like J. & E. Hall.³⁶

Using cold to mechanically refrigerate rather than create ice was about to become a mainstream practice. Many firms initially

THE BELL-COLEMAN MECHANICAL REFRIGERATION CO^o
MAKERS OF COLD AIR AND ICE MAKING MACHINERY.

USED ON BOARD SHIP BY THE ANCHOR LINE - ORIENT CO^o - P. & O. CO^o - GUION LINE -
 ALBION SHIPPING CO^o - CUNARD CO^o - TRANSATLANTIC CO^o OF SPAIN -
 QUEBEC STEAMSHIP CO^o - HUDSONS BAY CO^o - NORTH GERMAN LLOYDS -
 COMPAGNIE GENERALE TRANSATLANTIQUE - SHAW SAVILL & CO^o - AND OTHERS.
 USED ON LAND AT BACON CURING WORKS AT WATERFORD, LIMERICK & HAMBURG, AT
 PUBLIC ABATTOIR, SYDNEY N.S. WALES, AT FOREIGN ANIMALS WHARF, RAMSDEN
 DOCK, BARROW IN FURNESS, AT SLAUGHTERING & MEAT FREEZING WORKS AT
 ROCKHAMPTON, QUEENSLAND, AUCKLAND, NEW ZEALAND, & BERMUDA, WEST INDIES,
 AND IN SPERM OIL WORKS, BREWERIES, &c.



GLASGOW. 45, WEST NILE STREET. — LONDON. 21, ST HELENS PLACE, BISHOPSGATE, E.C.

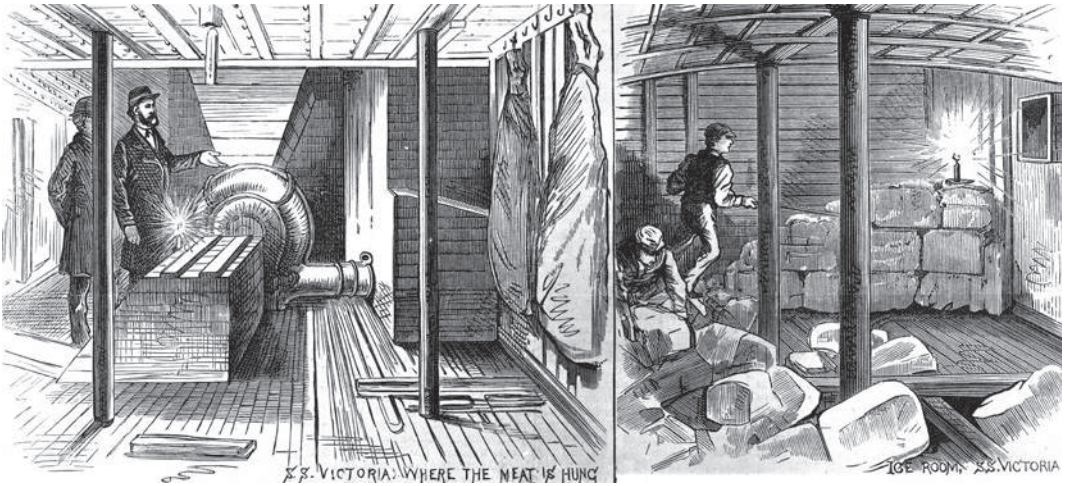
PRINTED & PUBLISHED BY THE BELL-COLEMAN & CO. LTD., 45, WEST NILE STREET, GLASGOW.

Advert for the Bell-Coleman Mechanical Refrigeration Co., c. 1890. It shows both the reefer ship and the refrigerated chamber and cold-air machine it housed, here being loaded with animal carcasses prior to setting sail.

concentrated on refrigerators aboard ship – moving meat, fish and dairy around the world. But in those early days of heady excitement in the industry refrigerators popped up all over the place. Some were prestige projects but soon everything from cold stores, breweries, skating rinks and morgues to ice cream vendors and hotels were being kitted out.³⁷ Since most refrigerating machines relied on steam power, they were, inevitably, big.³⁸ Commercial and industrial-scale refrigerators designed to cool or make ice flourished at a time when powered domestic refrigerators were still the stuff of fantastical dreams, if they were dreamt of at all.

Experimentation and popular interest and fascination were focused on large-scale refrigeration on board ships. The newspapers fed the public imagination with dramatic accounts of shipments arriving from far-flung places, as steamers such as the *Frigorifique* and the *Paraguay* tested the waters for a then uncertain cargo and market, transporting frozen meat from Argentina to France in the late 1870s.³⁹ Another ship, the *Strathleven*, was fitted with a Bell-Coleman cold-air machine to refrigerate a small

REFRIGERATOR



chamber containing a mere 40-ton cargo of frozen mutton and beef on its journey from Australia to London. The meat arrived in 'excellent condition', reportedly selling at Smithfield (London's largest and oldest meat market) 'at good prices'.⁴⁰ These early walk-in cold stores were undeniably uncomfortable places in which to work. Workers on board ships fitted with a J. & E. Hall cold-air store were to be shut in when they entered the 'meat chamber' during the voyage, as the manual made plain.⁴¹ Snow fell inside as moisture cooled, and had to be regularly cleared away in case it clogged up the machinery. No surprise then that Hall's instructions stated that 'men entering the cold chambers should take the precaution of breathing only through the nose and not through the mouth.'⁴²

There were the beginnings of a patchy, but progressively more influential, well-organized and joined-up cold chain that was in place by the end of the nineteenth century. It encompassed refrigerators and traditional non-refrigerated cold stores of varying scales using these various technologies at the place of origin, along the route, on board transport and at destination. Large machines were increasingly used portside to refrigerate goods arriving by ship, especially meat, fish and dairy produce. These machines were sturdy beasts built to last. A Lightfoot unit made for the Union Cold Store in Liverpool's docks was in operation from 1918 until 1980, when it was still in perfect running order.⁴³ The number of cold stores in ports, together with a growing number of markets and hotels equipped with

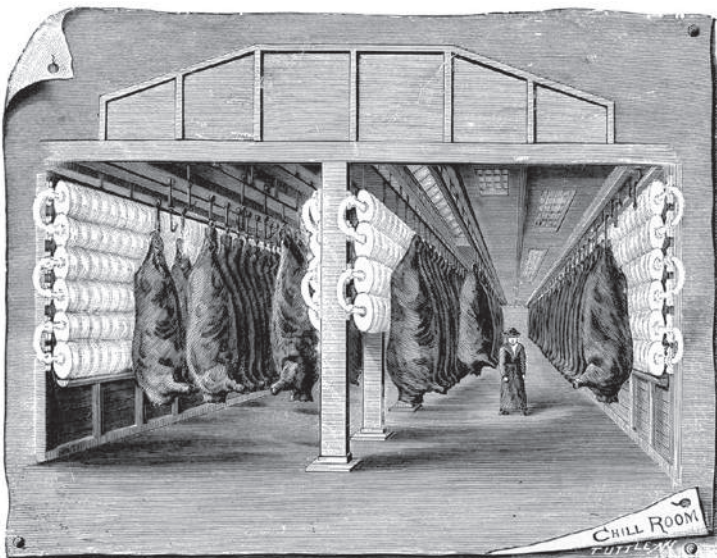
'Where the meat is hung'. Illustration from the *Illustrated London News* (1877) showing an ice room aboard the *ss Victoria*.

large refrigerators from the late nineteenth century onwards, acts as a clear indication of the increasingly symbiotic relationship between chilled food and the refrigerator, the growing availability of one feeding the need for the other in a cycle of dependency which has heightened ever since.⁴⁴ A whole new infrastructure was being built up just about from scratch, sometimes at incredible speed. For example in 1886 butchers and packing materials were shipped out from Britain to the Falkland Islands for a trail-blazing shipment of 30,000 sheep carcasses, because the Islands did not yet have their own infrastructure in place.⁴⁵

By 1900 there were 350 reefers (refrigerated cargo ships) in operation worldwide. By 1918 there were 230 British ones alone.⁴⁶ The eventual impact on farming and food supply chains was enormous. Refrigerated goods can be moved more slowly without spoiling, frozen goods slower still, enabling fresh meat, fish and other fruit and vegetables to be shipped around the world for the first time and fishing boats to stay at sea for longer. Instead of arriving at market 'on the hoof' from local sources, refrigerated beef and butter increasingly came to European markets and cold stores from Argentina and New Zealand. Preserved all the way along the cold chain, foodstuffs that were once luxuries or only available seasonally became commonplace and divorced from a sense of their seasonality and place. Local producers, many of them large-scale wealthy landowners, now held little sway over produce prices and were often dramatically undercut by lower-priced foreign imports as foreign farmers found new far-flung markets to sell in.⁴⁷ If the average consumer was initially dubious about whether the meat would be good quality, most were certainly won over by the low prices.⁴⁸ While local farmers sometimes lost out, the consumer on the whole benefited, although perhaps not to the extent that an Australian industry report suggested in 1895, commenting that: 'it is only by the use of refrigerating machinery that it is possible that we can convert our surplus into hard cash, and at the same time benefit the starving masses of Europe.'⁴⁹ Not everyone in Europe was convinced, however. For example, the persuasive powers of competing French butchers and farmers, together with the reticence of consumers to purchase, persuaded the French government to impose strict tariffs on imports of *frigo* (refrigerated and frozen) meat. As a result very little was imported into France until 1912



Meat being loaded onto a railway container on the back of a lorry at Smithfield market, 1938.



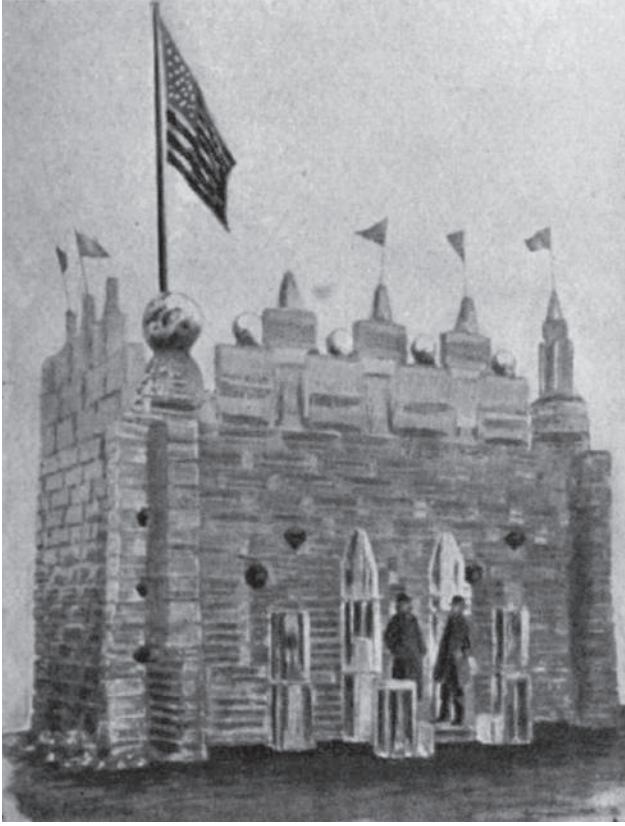
Chill room for beef from the De La Vergne Refrigerating Machine Company brochure (1898).

until high prices and food riots changed matters and a ‘cultural discomfort with refrigeration’ was overcome by necessity.⁵⁰

World-famous meat markets like London’s Smithfield – originally a live meat market with animals driven there and slaughtered on site – were increasingly chiefly dead meat markets reliant on their cold stores to keep (increasingly imported) refrigerated animal carcasses fresh. Smithfield’s live market was huge: roughly half a million sheep and a quarter of a million cattle were driven there annually by 1851. The mess, dirt and noise this brought caused widespread concern in the press. Many, including a self-proclaimed ‘Old Grazier’, were horrified by the ‘wretched state, and vile treatment’ the animals suffered,⁵¹ while Dickens immortalized the state of the market in his novel *Oliver Twist* as Oliver is dragged through the market by the villainous Bill Sykes. They navigated its grounds, ‘nearly ankle-deep with filth and mire . . . the reeking bodies of the cattle . . . the bleating . . . grunting and squeaking’ all forming a ‘stunning and bewildering scene which quite confounded the senses’.⁵² Eventually usurping the Aberdeen Angus beef arriving in the city by train, by the 1890s most of London’s meat was imported in a frozen state and by 1895 a startling third of all meat eaten in Britain was from foreign sources.⁵³ The impact of refrigerators was not always a welcome one, however. Poorer residents such as Tommy Morgan could pick up cheap offcuts such as ‘two pennorth of block ornaments’ from Smithfield’s butchers until refrigeration artificially prolonged their sales life and reduced the amount of waste.⁵⁴

The newfound enthusiasm for refrigeration was widely reflected in advertisements in industry publications such as the American monthly *Ice and Refrigeration*, glossy company brochures and the more mainstream newspapers. Many depict the huge scale of refrigerators, the resources needed to build them and the technical prowess and scientific ‘mystique’ they demonstrated with illustrations designed to impress. They feature large breweries – fitted out for cooling by both natural ice and refrigerator; high-tech dairies, butter factories and meat stores, among many other applications.⁵⁵

Brochures extravagant in their use of quality images and gilt-edged pages (such as that by the De La Vergne Refrigerating Machine Company) detail the vast range of refrigerating

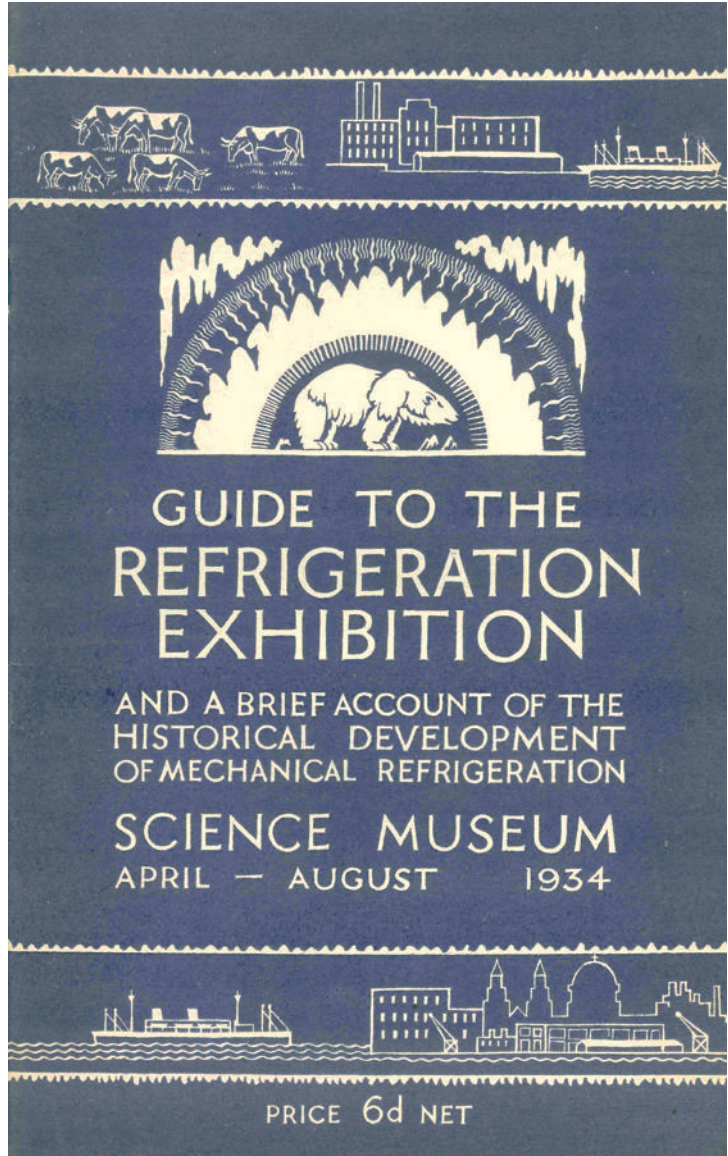


'Tower of Ice Blocks
Made with Our Machines'.
Illustration from the De
La Vergne Refrigerating
Company catalogue (1898).

machines available. The 'constantly increasing patronage' they received justified the lavishness of the brochure as well as the number of editions published.⁵⁶ Some refrigeration products were evidently 'prestige projects' used to drum up press interest, such as a wacky life-sized crenellated tower made from ice blocks. The world was turning cold. So cold that it is perhaps a surprise that it took so long for a dedicated exhibition to reach the Science Museum.

Exhibiting refrigerators has formed an integral part of the industry's attempts to get both public and industry to 'buy in' to the technology, as the 1862 exhibition had already demonstrated. In 1934 the Science Museum hosted the Refrigeration Exhibition, 72 years after the 1862 International Exhibition and a hundred years after Jacob Perkins's breakthrough machine. The exhibition was something of a retrospective, serving to get people up to speed with developments in refrigeration technologies to date. Many of the leading refrigerator companies of the

time loaned machinery and models for the exhibition. A few artefacts, some images, an exhibition catalogue and some correspondence held in the bowels of the museum's stores are possibly all that remain of the 1934 exhibition. The exhibition featured working exhibits and models designed to describe the basic scientific principles on which refrigerators work in sophisticated formulae-ridden text alongside displays describing the effects of refrigeration on food. As such it was firmly in the tradition of



The front cover of the 1934 Refrigeration Exhibition catalogue shows that the commercial end of the cold chain was at the heart of the exhibition. The cows, factory, ship and port illustrate the cold chain journey from source to port destination in visual form.

other contemporary exhibitions at the museum, which in their collaboration with industry often explicitly sought to ‘influence the public’.⁵⁷ Displays showed how refrigeration slowed food decay and charted the temperatures at which a multitude of different foodstuffs should be transported and stored.

Part of the message of the exhibition was to outline the sheer mass of goods – not just foodstuffs – moved by and manufactured with the use of refrigerators, which the exhibition made plain for all to see. The catalogue listed thirty countries as importers of refrigerated foodstuffs to the United Kingdom in 1932.⁵⁸ All eyes were firmly on large-scale commercial refrigeration. The exhibition catalogue cover itself makes this plain, showing the key role played by refrigerators all along the food chain from food source to destination port. It showed the extent to which refrigeration had impacted on our world above and beyond its most well-known use to store and transport foodstuffs. A review of the exhibition in *Nature* identified more than three hundred industries in which refrigerator use was ‘either essential’ or ‘improves the quality of the product’.⁵⁹

Refrigeration exhibits displayed a range of power sources and a vast array of uses. What is even more striking about the exhibition is what was missing from it – mechanically powered *domestic* refrigerators. Read the exhibition catalogue and you will find that only one of the 47 exhibits showed new powered domestic machines. The major discussion about the small domestic refrigerator display at the exhibition revolved around a far more important battleground within the power supply and appliance industries – that between electrical and gas power. Gas suppliers queried why there was only a domestic electrical model on show.

There are obvious reasons for the absence of smaller domestic refrigerators. Although by the time of the 1934 exhibition large powered appliances – with refrigerators, washing machines and cookers at the vanguard – were beginning to make a real impact in the American home, vying with each other for precedence in the pecking order of home purchases, they were only just beginning to catch the attention of homeowners elsewhere in the world. They certainly were not a major consumer good in Europe. As the 1934 exhibition catalogue inadvertently reflects, the domestic refrigerator’s future was, at that time, in

THE BIRTH OF COOL

the relatively early years of the twentieth century, still uncertain. The future impact it would have on homes and lives was as yet unimagined and unimaginable.



3 DOMESTICATING COLD

By 1960 many households in America and around the world were sold on the idea of the domestic refrigerator as a desirable consumer good. The popular soul singer Ray Charles provided a touchstone to aspirational American living, singing about the Frigidaire he was going to buy his ‘honey’ in their move to the modern suburbs.¹ His ‘honey’ and he had made it, replacing the soon to be outdated daily visit from the iceman with a modern electrically-powered machine. More than that, refrigerators were increasingly seen not just as a luxury, but as a home necessity. Frigidaire, like Kelvinator and Electrolux,² was a household name, synonymous with refrigerators in the same way that people often ‘hoovered’ rather than ‘vacuumed’ their floors. Refrigerators were widely viewed as essential for the modern home. This success was hardly predictable forty years earlier. Homeowners still relied on hand-delivered supplies of competitively priced natural or artificial ice for their refrigeration needs despite the impressive power and evident utility of the commercial artificial refrigerators available. With an ice-delivery infrastructure well established in America and Britain, the iceman was a daily visitor to the home well into the mid-twentieth century. These deliveries were usually made by horse-driven cart, with icemen using sacks to pad out their shoulders and lug the huge lumps of ice into homes more easily. Given the hard physical work involved, delivery costs varied dramatically depending on whether the iceman dropped ice ‘at curb’, entered the house and went up the stairs or, in an

Ice girls making deliveries to the door in early 20th-century New York.

apartment, sent the ice up by dumbwaiter and unloaded it at the top.³

The fundamental way in which domestic refrigeration worked was about to change. To be serious about reducing the temperature of food and drink at home, a way needed to be found of maintaining a consistently cold temperature. This is difficult in an icebox cooled by inexorably melting ice blocks. It was time to explore the large-scale technologies developed in the nineteenth century and apply them on a smaller scale. For the emerging mass market for refrigerated meat, fish and other perishable goods to stand a chance of long-term success, refrigeration in the home needed to catch up.

Developing the domestic refrigerator into the type of home appliance recognizable today wasn't easy. Although the principle of cooling is simple enough, refrigeration technology is complex.⁴ While early domestic refrigerators utilized the same scientific principles as their large-scale relations, the need to make domestic machines more user-friendly, reliable and automatic in operation was keenly felt. And anyway, as far as the average consumer was concerned, iceboxes functioned perfectly well. Why invest in yet another new piece of household equipment and go to the expense of buying a newfangled powered refrigerator unless the benefits were obvious?⁵ It is not a coincidence that when Frigidaire introduced their smaller refrigerator into Britain in the 1920s they called it the 'electric ice box'. This suggests that the mode of powering was to be emphasized to make it stand out alongside the similar physical materiality of a traditional (icebox) refrigerator.⁶ Consumers were going to take some persuading to accept refrigerators as not just an aspirational 'luxury' good but a useful addition to the home.

Early twentieth-century domestic refrigerator manufacturers adopted and 'finessed' existing commercial methods of powering refrigeration for smaller machines. Crucially, compressors driven by an electric motor – one of the breakthrough technologies of the nineteenth century – were finally made small enough to fit into a domestic-sized machine, at last making the prospect of powered refrigeration in the home a steam-engine-free possibility.

As was often the case with domestic appliances, America was ahead of the game. A cluster of smaller powered refrigerators

came onto the market between 1910 and 1920. Early domestic models were often temperamental, noisy, had fiddly water-cooled systems, were expensive to run and maintain and were certainly not the 'finished article'. From the 1920s, despite a naturally slow start (given initial small consumer demand), designers, engineers and manufacturers in the U.S., Europe and elsewhere sought to improve refrigerator operation. Features such as interior lighting and auto-defrost settings were also added, making them more user (and home) friendly. One contemporary American commentator summarized it nicely, suggesting that in the 1910s and '20s manufacturers had a 'long, hard struggle to overcome mechanical deficiencies, build up a volume demand and meet other competition for the public's dollar'.⁷ Even in America, though, uptake was slow.⁸ One of the main reasons was cost, as these appliances were still expensively hand-made rather than mass-produced. For example, the *DOMELRE* (short for Domestic Electric Refrigerator), introduced in 1913 as basically an electrically powered cooling unit attached to the existing icebox, cost an exorbitant and largely prohibitive \$900, over twice the price of a Model T Ford around the same time. Cost prompted Henry Ford himself to comment that 'there is some machinery to use in the kitchen today . . . various electric appliances . . . electric ice boxes – but most of them are still too expensive.'⁹ In response, the well-regarded journalist Allene Sumner pithily commented that 'it takes a man of course, to tell the great American housewife what's wrong with her system.'¹⁰

There were many things that could go wrong with early domestic refrigerators and engineers were wise to a whole variety of problems that they could be called on to sort out. Machines could short cycle (operate and stop for short periods of time), fail to cool, fail to freeze ice cubes, be excessively noisy for a variety of reasons and interfere with the radio. Leaking refrigerants could produce strong odours and the liquid lines could frost up. Long running-time and overcooling could be due to any of 25 possible reasons, from ill-fitting refrigerator doors and 'overcharge of refrigerant' to a 'leaky float valve'.¹¹

None of these potential irritations appeared in early refrigerator adverts, of course, which did not illustrate the downsides: the noisy and needy compressor used to power the machine, the necessity for a connection to a water source for some early

models, the size and weight of early machines and the relatively small internal storage capacity of many refrigerators given the thick insulated walls of machines. Early refrigerators were unashamedly an expensive novelty and luxury. Early advertisements reinforced this, depicting sophisticated ladies in evening gowns and gentlemen in eveningwear clustered around a gleaming white refrigerator as the star of the show: its innards containing perhaps the odd spectacular dessert, but mainly purchased as ‘an excellent way of cooling champagne’.¹² Commentators drew comparisons between these adverts and the modish classical Rome-inspired nineteenth-century paintings with their ‘marble halls’ and toga-clad elegant ladies by the likes of the painter Sir Lawrence Alma-Tadema.¹³

In the early years, manufacturers moving into domestic refrigeration were taking a bit of a punt. Many did not survive the early years, or were swallowed up by bigger and better funded companies: such as the Isko in America, previously the DOMELRE but sold to the Packard Motor Car Company, which was itself then purchased in 1922 by Frigidaire, who were keen to get their hands on the company’s patents.¹⁴ Some manufacturing started small and as lower-profile offshoots of general manufacturing or electrical engineering firms.¹⁵ For example, Prestcold (eventually Great Britain’s largest refrigerator manufacturer), produced their first machine on the balcony of the car body workshop of their parent company Pressed Steel.¹⁶ One analyst, reflecting back over the formative years of the industry, commented that these early pioneers were ‘working with whatever materials were available’, having to ‘improvise and develop their ideas by trial and error’.¹⁷

Those that flourished in the long term worked hard to introduce mass production methods and reduce the cost of finished machines. Alfred Mellowes’s Guardian refrigerator,¹⁸ for example, was initially arduously hand-built in a ‘backyard wash house’ in Fort Wayne, Indiana.¹⁹ Unsurprisingly he only produced forty machines in two years of operation. His company quickly morphed into the better-known Frigidaire after General Motors president William Durant bought him out. As a result, the first Frigidaire was rolled out in 1918 with the millionth one produced only eleven years later.²⁰ With their thriving automobile assembly-line system, the Detroit-based company were well

Electrolux gas absorption domestic refrigerator, a pioneering type of absorption refrigerator, originally supplied to King George v at Sandringham by Electrolux Ltd, Luton, 1927-35.



Close-up of Electrolux refrigerator, c. 1930, showing part of the operating mechanism and instructions on the side of the machine.

placed to produce refrigerators en masse. After all, producing a refrigerator carcass was not so very different from producing a car body – simply fold a metal (steel) sheet – it was just the innards that were different.²¹ A description of mass-production methods in Britain in the mid-twentieth century is fairly typical of refrigerator manufacture in the United States and elsewhere at the time. Once the sheet steel had been ‘bent in a press to make the two sides and the top’, other processes like hole drilling were carried out.²² The main refrigerator cabinet and sub-assembled parts were then fitted together by spot welding, commonly moving in batches on rollers between the various manufacturing stages. The cabinet units were then ‘hung on overhead conveyors called stillages’ and pickled (bathed in acid) to make them rust-proof before being sprayed with paint.²³ Often one company provided the same part to multiple manufacturers. For example, in the mid-twentieth century the engineering company L. Sterne & Co. Ltd from Glasgow were making the sealed compressor units for most British refrigerator manufacturers.²⁴

When companies saw a good idea they were fast to procure the patent. Electrolux bought the technology behind their famous machine from the Swedish engineering students Baltzar von Platen and Carl Munters, who had originally developed the idea of a silent domestic gas absorption refrigerator.²⁵ Their first machine was produced by the newly formed company AB Arctic in 1923 while the Electrolux version was launched as the popular Electrolux ‘D-fridge’ only two years later. The Electrolux could use electricity, gas or oil to drive the cooling cycle. Its full working title was the clunky Domestic Electrolux (Ammonia – Hydrogen) Refrigerator.²⁶ Electrolux’s Luton factory was one of the first electrical appliance factories in Britain to introduce mass-production methods.²⁷ But while the silent gas absorption machines like the Electrolux were popular, in the long run, in Britain as in the United States, they lost out in the market for consumer goods to electric models.

One such market winner was the American company General Electric, which had already dipped its toe into the development of domestic refrigerators, selling an electrically powered machine for which they had acquired the rights from the French monk Abbé Marcel Audiffren.²⁸ They sold a few hundred of these each year. The company reached a point in

Advert for General Electric Monitor Top refrigerators from the *Saturday Evening Post* (1934).

THE SATURDAY EVENING POST

THEY CREATED A NEW

Style Sensation in Electric Refrigerators!

BEAUTY OF DESIGN now complements the refrigerator mechanism famous for its performance record throughout the world.

Seven years ago General Electric introduced the first Monitor Top refrigerator. 15 previous years of research, in the famous General Electric House of Magic, had perfected a matchless mechanism that set a new standard for quiet, dependable, trouble-free refrigeration service at low cost.



MATCHLESS MECHANISM!

In less than five years 1 out of every 3 electric refrigerators in America's homes was a General Electric Monitor Top—according to independent surveys. It became universally recognized as the

standard of excellence. Even in the movies you will note a General Electric Monitor Top refrigerator is almost invariably shown when the scene represents a modern kitchen.

Here is the refrigerator with a mechanism that is built for a lifetime, hermetically sealed within walls of ageless steel, and requiring no attention from you, not even oiling.

Now, to perfected and proved mechanical performance that is unequalled, General Electric adds brilliant beauty and distinguished cabinet styling. The skill and genius of America's foremost designers has been drawn upon, and in these new de luxe models General Electric offers you the aristocrats of all refrigerators. They have created the style sensation of 1934!

There are only two styles of electric refrigerators . . . Monitor Top and flat-top. See them both at your General Electric dealer's display room.



DISTINGUISHED STYLE!

In General Electrics you will, of course, find all the modern features: All-steel cabinets, porcelain inside and out. Sliding shelves. Foot pedal door opener. Interior lighting. Control for fast or slow freezing. Stainless steel quick freezing chamber. Automatic defrosting. Removable vegetable compartment.

For your nearest G-E dealer see "Refrigeration Electric" in classified pages of your 'phone book. General Electric Company, Sec. S-42, Appliance Sales Department, Nela Park, Cleveland, Ohio.



Two new de luxe models! New, distinguished style joins matchless mechanism.

GENERAL  **ELECTRIC** *All-Steel Refrigerator*

the mid-1920s when a decision had to be made as to whether or not to pursue it wholeheartedly as a commercial venture: a brave move considering their research had already incurred heavy financial losses. The machines were expensively produced, largely by hand, with production yet to benefit from mass-production methods. They sent Alexander Stevenson (then assistant to General Electric's Vice President of Engineering, Francis Pratt) to investigate. He spent five months interviewing experts and other manufacturers, surveying the existing domestic refrigeration technology and exploring the possibilities for General Electric to fulfil their ambition to not only find their niche in the domestic refrigerator field but become market leaders. His report – the first engineering report on domestic refrigeration – stretched to an exhaustive (and exhausting to read) 544 pages.²⁹ It included a comprehensive engineering analysis of competing machines – some still familiar today and some long forgotten – including ones by the Frigidaire Company, the Glacifer Company, the Isko, the Knickerbocker Ice Company, the (French) Frigor and the Kold King Corporation, as well as General Electric's own Audiffren machine. Copious contextual material outlined everything relating to refrigerator and icebox performance, from comparisons in performance between various refrigerants (including their toxicity and explosiveness) to the costs of ice deliveries to houses, the amount of meltage and the average compartment temperature in competing iceboxes using ice as the coolant at the time. Stevenson's report succeeded in persuading General Electric to build on the work done on the Audiffren machine and plunge into the domestic refrigerator market. It released the gleaming white steel-bodied Monitor Top refrigerator onto the market shortly afterwards, based on a total of nearly fifteen years of research and development.³⁰ Designed by General Electric's chief engineer Christian Steenstrup, the machine had a new clean, white aesthetic together with the first all-steel refrigerator cabinet and the distinctive (hermetically sealed) compressor on top.³¹ Unlike the iconic Monitor Top shown here, Steenstrup's first commercial sample did not have the traditionally styled legs, its flat bottom standing flush with the floor.

Designing and developing refrigerators was a resource- and time-intensive process. A fascinating description of the design

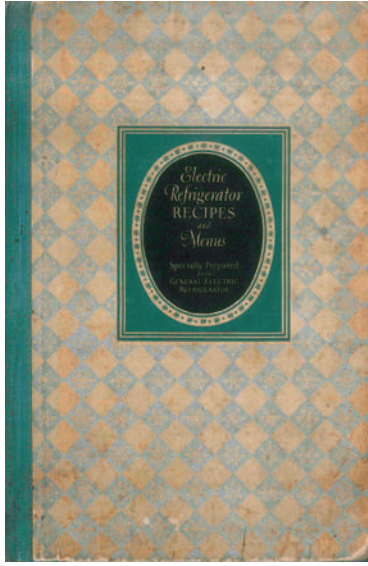
DOMESTICATING COLD

Interior view of the prototype Prestcold Packaway owned by John Pollak, showing the temperature control and freezer compartment.



process adopted by electric refrigerator manufacturer Prestcold in the late 1940s makes this clear. Prestcold's Engineering Department at the time employed forty people organized into three sections. First was the 'boffins', with their engineering, physics and mathematics expertise; second, the 'Development and Production Design Crews', who developed machines for trial and later manufacture; and third, the engineering assistants and mechanics who produced the test models. The sophistication of their research and development process extended to testing environmental conditions, under which their refrigerators might operate, in an 'experimental room' where all manner of climatic conditions between the 'English spring and the

REFRIGERATOR



Alice Bradley's General Electric cookbook contained detailed information about the advantages of the electrically powered Monitor Top in safeguarding health and preserving food.

Persian Gulf' were simulated. As their consultant engineer Eric Rowledge admitted, it was 'not a simple matter to engineer, design and build a new range of household or commercial refrigerators which will be good to look at, give the user all he wants . . . Be efficient and reliable, and at the same time competitive in price.'³² Rowledge summarizes the design and production process as 'long, tedious and fascinating', taking on average two years to see a product through from concept to market. In the case of their 1940s breakthrough Presmatic unit the process took seven years.³³

John Pollak, the son of Bedrich Pollak, one of the original Design Team members of the innovative 1950s compact refrigerator the Prestcold Packaway, vividly remembers a model being delivered to their house for testing when he was a child in the mid-1950s. It caused a stir, providing much-loved orange squash ice lollies, as well as being stocked up with milk and vegetables by his mother. In order to analyse performance, his father proceeded to:

place thermometers in four positions within the compartment . . . A fifth thermometer was placed in the kitchen to monitor ambient temperature. All five temperatures were religiously taken and entered into a notebook 3 times a day.³⁴

Advertisement from 1930 for General Electric's Monitor Top refrigerator. This refrigerator, the ad told you, was so well built as to be 'trouble proof'.



SEALED IN STEEL

SO TROUBLE PROOF

*that even drowned in water
...it still runs on*

SO TROUBLE-PROOF that of the hundreds of thousands of owners, *not one* has paid a cent for service

THEY submerged it in water—and it still ran on. Think of the significance of such a test to you! Dust, dirt, moisture, rust—that lead to breakdowns and repair bills—are *powerless* to halt it. In that small round casing on top of every General Electric Refrigerator, the entire mechanism is *sealed in steel!*

Here is a refrigerator that gives you all the advantages of electric refrigeration—and a great deal more besides. A mechanism so efficient that your electric current bills are cut to a few cents a day. An incredible quietness of operation the day you buy—and *always*. A freezing regulator that is right at your finger-tips. A snow white porcelain-lined cabinet that will wear like steel—because it is *all-steel*.

Years have passed since the first General Electric Refrigerators started running—and still they run on! Of the hundreds of thousands of owners—*not one* has paid a cent for service!

Prices now start as low as \$205 at the factory—and most people buy on our easy time payment plan. For our illustrated booklet, address Section R-5, Electric Refrigeration Dept. of General Electric Co., Hanna Bldg., Cleveland, Ohio.

Join us in the General Electric Hour, broadcast every Saturday evening, on a nation-wide N. B. C. network.

GENERAL  ELECTRIC
ALL-STEEL REFRIGERATOR

Even the best available refrigerator models of their time, like the Monitor Top, needed hardcore selling. General Electric did this spectacularly well with the Monitor Top, pursuing a forceful marketing campaign aimed at potential consumers. Adverts, detailed installation manuals, an operating guide and a dedicated and desirable cookbook (*Electric Refrigerator Menus and Recipes*), embellished with a silver design and written by the well-known American home economist and head of the famous Miss Farmer's School of Cookery Alice Bradley, accompanied its launch. The refrigerator's prominent exterior compressor was a clear sign of a machine that wore its engineered heritage

heavily but proudly. It was also the first domestic refrigerator compressor to be hermetically sealed, making it far easier to maintain.³⁵ As their adverts boasted, the whole refrigerator was dependable, being 'sealed in steel',³⁶ the 'entire mechanism . . . fortified against air, dirt and moisture with impregnable walls of steel'. When tested, whether being 'buried in sand, frozen in ice, drowned in water, roasted in flames, the General Electric still ran on!'³⁷

Their salesman's bulletin listed all the particular features for each model, highlighting its modern technology and ease of use.³⁸ This quickly served to make the Monitor Top a best-seller.³⁹ Salesroom windows even displayed the machine dramatically submerged in water-filled glass tanks. General Electric, maestros in marketing, were pressing all the right buttons to get the consumer to purchase. One Monitor Top was sent to the North Pole by submarine with *Believe It or Not!*'s Robert Ripley in 1928 while the millionth machine was presented to Henry Ford himself in a 1931 radio broadcast.⁴⁰ The Monitor Top proved to be one of General Electric's most popular products, and indeed furthered the cause for the long-term success of relatively noisy electrically powered refrigeration over the silent gas absorption equivalent both in the United States and abroad. Although gas absorption models are still in use today – for example in caravans – most use electricity.

Early European refrigerator adopters faced real disincentives to purchase, their choice limited to bulky and expensive imported models.⁴¹ For the early twentieth-century British housewife the situation was not always clear: even if you had the disposable income available to afford a powered refrigerator, why spend money on one when you probably had fresh food regularly delivered to the home? There was also the hefty problem faced in Britain that until 1933 and the completion of the original National Grid, British electricity supply was not standardized. Even then only 32 per cent of the country was connected.⁴² Electricity supply was piecemeal and concentrated in urban areas (making gas refrigerator models the early firm favourite). On the other hand, a decline in the number of servants after the Second World War – a much greater problem in America than in Britain initially – and the fact that purchasing new technologies such as domestic refrigerators could actually

help to retain home help, and were sometimes marketed accordingly, made them more attractive to the wealthy.⁴³

A symbiotic relationship between electrical supply industries and appliance manufacturers ensured that companies eventually turned to the development of first small and then larger domestic appliances in the early twentieth century. Although homes were first wired for lighting, companies soon realized that at off-peak times, demand for electricity could be promoted by developing other domestic electrical appliances. Companies soon set up factories in the UK to manufacture machines locally, Electrolux building their gas absorption refrigerators in Luton from 1927, for example.⁴⁴ British companies also manufactured more fridges themselves. By the 1930s the British Thomson Houston Company (BTH) was making Monitor Top refrigerators for General Electric, and Prestcold had set up their Domestic Refrigeration Factory at Cowley near Oxford.⁴⁵ In other countries the picture was similar. For example, Frigidaire refrigerators were built in France's Parisian suburbs from the 1920s. The factory produced its millionth refrigerator in 1961, hailing the achievement in a full-page advert in *Paris Match* showing their

Distinctive Monitor
Top compressor units
on the assembly line
in Britain, c. 1930s.



machines loaded onto a freight train in front of the factory.⁴⁶ Electrolux also established factories in France, among other countries, while in Australia General Electric began manufacturing Monitor Top refrigerators in 1931. The German company AEG – associated with electrical engineering – produced their first compressor refrigerator in 1929 while Bosch launched their first home-grown (barrel-shaped) refrigerator in 1933, manufacturing their one-millionth machine in 1956.

Despite the public's growing familiarity with refrigerators, as yet they were hardly a mass-consumer good.⁴⁷ Smaller, cheaper (mass-produced) models designed for generally smaller British and European homes helped, of course – making it easier for a manufacturer's advertising to successfully lure the consumer. For example, Electrolux's LI of 1932 (their first air-cooled model) retailed at a relatively affordable £19 15s.⁴⁸ The downside was its small size: 1 cubic foot (0.02 cubic metres) with a shelf area of 1.9 square feet (0.2 square metres) and capable of holding only six pints of milk and a few packets of butter. Its diminutive size and cost made it very popular despite this, with large numbers being used in flats where it was obviously easier to incorporate a relatively squat model rather than the loftier 13-square-foot models available previously.⁴⁹

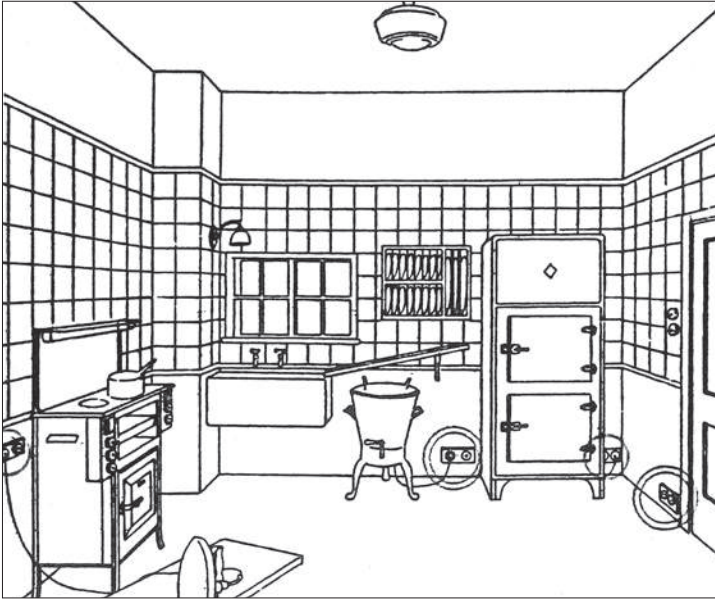
In Britain and Europe, refrigerators were still largely the domain of higher-income households, with 'status symbol' significance in the home well into the 1950s.⁵⁰ Persuading the British public to buy into refrigeration was as much about disposable income as it was about marketing refrigeration in general and gas or electrically powered machines in particular. Broadly, refrigerators were increasingly portrayed as being cost-effective and labour-saving additions to a well-planned modern kitchen and home. Above all, however, they were promoted as aspirational and new, this newness sometimes tempered with notions of sturdy traditional workmanship and dependability.⁵¹

Early on, newness was usually equated to novelty and luxury. But later marketing tactics shifted towards portraying refrigerators as new in other ways: as providing a new and safer way to preserve food and health; incorporating new technology (or upgraded models with new features) to fit into a newly planned kitchen; and creating a novel type of cooking and

Family-sized Electrolux refrigerator being demonstrated, c. 1933. Compact refrigerators like this were easier to fit into smaller British homes and cheaper to purchase and run.



REFRIGERATOR



Electricity supply arrangement for an electric kitchen including a permanently wired-in cooker and plug point for a freestanding refrigerator, from a 1929 publication by the Electrical Development Association (EDA).

cuisine. Many firms invested vast sums of money in promoting their new machines, while dealers were often voracious in their appetite to persuade people to buy, as the language in the *American Journal of Marketing* in the 1940s illustrates. In trying to identify ways to sustain refrigerator sales during the Second World War, one article in the magazine identified potential purchasers as a 'layer of cream to be skimmed' on which 'a direct attack' might yield more sales.⁵²

The notion of the refrigerator as a modern and progressive force in our homes and in society was promulgated at trade shows, exhibitions, sales rooms and showrooms, and in domestic literature and other advice and advertising issued by government bodies, electricity and gas companies and interest groups alike. While refrigerators initially appeared as a useful extra appliance, they later appear as a fitted necessity for the planned modern kitchen, designed to minimize a housewife's effort in the home. In Britain, manufacturers, government departments, other interest groups representing industry (including the Gas Council and the British Electrical Development Association (BEDA) also known as the Electrical Development Association or EDA) and the consumer (for example, the Electrical Association for Women and, later, *Which?* magazine) were all involved in promoting refrigerators and their virtues in the home. The EDA's

1929 pamphlet *The House You Want* revealed its educational aims clearly, describing how to wire up a home, ‘including a kitchen appointed with enough sockets to use electric cooker, refrigerator, wash boiler and other smaller appliances if desired’.⁵³ *Good Housekeeping* saw the kitchen as ‘The working centre of the house, the laboratory in which the family meals are prepared.’⁵⁴ This ethos was reflected in refrigerator adverts, which were routinely imbued with the new factory rhetoric – of modern manufacture and new innovative appliances in rationally planned kitchens. An emerging aesthetic – embodied in a move to cleaner streamlined models, a hygienic modern white finish and modern materials – was also key. The Council of Industrial Design – at the forefront of encouraging improvements in British design after the Second World War – was far from alone in wanting to open up the home space and bring the kitchen in.⁵⁵ However, while the demise of the parlour was on the wish list of most designers and architects, not all homeowners were keen to move into such modern homes. Traditional ground-floor layouts – with a back kitchen and a small front living room (parlour) for special use – were viewed as preferable well into the twentieth century. As one Lancashire resident recalls, ‘It was class to have a parlour . . . You lived in the kitchen and then you went in the parlour for your best room’, one Lancashire resident recalled. ‘It was just used on special occasions . . . [for] visitors, weddings, funerals, birthdays, happen on a Sunday.’⁵⁶

However, the factory system thesis of efficiency in the home first encountered earlier in the century was particularly long-lasting. Prestcold promoted its 1960 refrigerator models as fitting the spirit of kitchen design, which aimed to help housewives: ‘a kitchen’s machinery must be designed in a way to make work easier, in just the same way that a factory is laid out to reduce fatigue.’⁵⁷ The French refrigerator manufacturer Frigéavia’s adverts in *Paris Match* proudly highlighted their French parent-company’s hi-tech industrial pedigree, depicting Concorde – a shining example of French (and British) engineering at the time – alongside their refrigerators with the strapline ‘la technique aviation au service du froid’ (aviation technology in the service of cold).⁵⁸ The futuristic rhetoric of adverts in the period drew a vivid picture of a raft of designers and scientists

working flat out to develop new and improve old models of appliances to fit into homes. There was to be no argument: 'Accept that housekeeping, like everything else, is deep in the machine age.'⁵⁹

State-of-the-art and expensive refrigerator displays trundled out to trade shows the world over. For example Prestcold's mid-century fleet of 'Showmobiles' toured the shows in a 'complicated pattern of operations' which would not have disgraced 'Monty's H.Q.' They were not the only company using a dedicated plane to transport their sales reps around the world. LEC, for example, had a flying showroom,⁶⁰ while Prestcold's sales brochures show images of their refrigerators being distributed all around the world; they were unloaded at Tunis docks, delivered by handcart in Peru and made long-distance road trips in Australia.

Sales reps weren't doing their job unless they were making it clear that installing one electrical appliance was 'only in the nature of taking the "first instalment" of the complete electric kitchen which will surely come sooner or later', suggested *Electrical Trading* journal. Why? Because their sales experience suggested that once one machine was purchased housewives usually wanted to upgrade more, or even redecorate their entire kitchen. Anecdotal evidence suggested that one local decorator



Prestcold refrigerator money box used as a marketing tool to encourage households to feel they could save up for and afford a new fridge. Today, miniature Monitor Top piggybanks are collectibles.

Appliance Color BULLETIN NO. 61



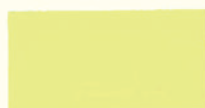
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COPPER BROWN



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TURQUOISE W-413-21



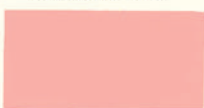
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BLUE



No. 22 72948
CANARY YELLOW



No. 2 27839
COPPER TAN



No. 9 61882
PINK



No. 16 67049
COPPER PINK



No. 23 72949
TURQUOISE



No. 3 60544
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GREEN



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PINK



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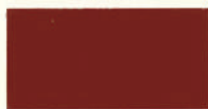
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TURQUOISE



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YELLOW



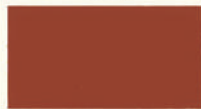
No. 25 72951
WOODTONE BROWN



No. 5 60621
COCOA BROWN



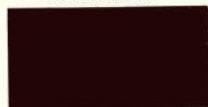
No. 12 67037
YELLOW



No. 19 67054
BROWN



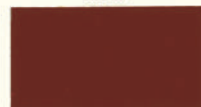
No. 26 74522
BLUE



No. 6 60622
DARK BROWN



No. 13 67038
GREEN



No. 20 67146
LIGHT COPPERTONE



No. 27 75308
SHERWOOD GREEN #103



No. 7 60639
GRAY W-606-21



No. 14 67039
PINK



No. 21 67147
DARK COPPERTONE



No. 28 75320
YELLOW

DuPonts's Duco-Dulux paint bulletin, 1961. Chip no. 27 was used by manufacturer Frigidaire as 'Sherwood Green'. Some colours were used by multiple manufacturers under different names.

followed the sales rep 'as regularly as the tail follows the dog – and I gather that the tail wags very happily'.⁶¹ Salesroom demonstrators ('demons') were, it concluded, best placed to sell a complete suite of appliances to the consumer.

From the 1950s aesthetics and image were also increasingly used to market refrigerators. Increasingly, style sold, colour sold, glamour, name and image sold. The fact that the name Frigidaire is still synonymous with 'refrigerator' in the language of many countries today – including France, Spain and America – reflects the success of their brand and marketing.⁶² Refrigerators were available in a range of fashionable colours. Colour-coordinated kitchens with appliances in complementary

**NOW! THE SIZE YOU NEED
IN THE COLOUR YOU LIKE
FOR AS LITTLE AS 66 GNS!**



This new 4.3 cu. ft. "Family" Frigidaire is ready to brighten your life with all the lively new colours you see here. Nothing smaller than this "Family" model is big enough. Big enough to hold all the food that should be kept fresh for the family, yet small enough to fit into any kitchen.

Match – and glorify – your kitchen colour scheme with a new Frigidaire in Snowy White, Cotswold Cream, Sherwood Green, Stratford Yellow, Olympic Red or Everest Blue! And remember, Frigidaire's exclusive "Meter-Miser" power unit cuts operating costs to the bone – actually uses less current than an ordinary light bulb!

FREE! Write today (address below) for free illustrated literature that gives all the facts about Frigidaire and the exclusive "Meter-Miser" power unit (backed by 5-Year Warranty).



MADE IN BRITAIN BY FRIGIDAIRE DIVISION OF GENERAL

124

Frigidaire advert highlighting the range of colour combinations available, including Sherwood Green and Olympic Red.

DOMESTICATING COLD

Olympic Red Frigidaire electric refrigerator, model OT 44A, c. 1952, complete with gold crest at the top. Made in England by Frigidaire and previously owned by historian Maxine Berg.



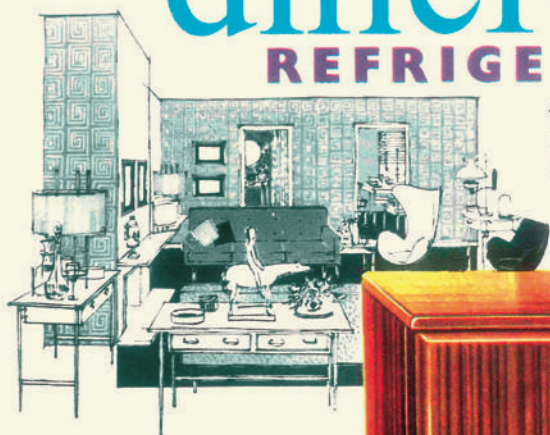
colours were increasingly popular – in part because new plastics materials (including polythene, nylon and a range of popular Formica finishes) were cheaper to make and more freely available than ever before. DuPont supplied their ‘Duco-Dulux’ enamel paint finish to all the major American refrigerator manufacturers, including General Electric, Kelvinator, Norge, Cold Spot and Westinghouse. Their *Appliance Color Bulletin No. 61* (1961) shows a typically contemporary range of pastel colours with a preponderance of pale pinks, creamy yellows and turquoise, alongside other colours. Some refrigerator manufacturers even utilized the same paint colours from the DuPont chart but with a different name, with for example colour chip no. 28 in the bulletin being used by Frigidaire as ‘Sunny Yellow’ and plain ‘Yellow’ by Philco, as shown in the bulletin.

Switch from this to a brochure or advert aimed at the potential customer and these paint colours are more clearly imbued with remarkable imagery, names and meaning. Culturally specific colours could adorn your new ‘Family’ Frigidaire which

the magnificent new

TRICITY diner-cold REFRIGERATOR

for dining-room
hall or lounge



A revolution in refrigeration by TRICITY, pioneers of so many advances in design and labour-saving for the home. Finished in superb sapele veneers, the new 'Diner-Cold' is a beautiful piece of furniture which will enhance any room of the house . . . to free kitchen space, provide additional cold storage, or allow straight-to-table serving of ice-cold drinks and sweets. Features include: 4.5 cu. ft. capacity; automatic interior light; compressor refrigeration unit, 5 year guarantee; salad drawer with glass lid/shelf; tuck-away egg rack and ample room for bottles on door; special dairy compartment; fish/meat tray; enclosed freezing compartment and fats tray.



69

GUINEAS

Tricity 'Diner-Cold' Junior: 3½ cu. ft. model:

57

GUINEAS



Write now for:
Illustrated colour literature, Tricity Cookers Limited,
Thorn House, Upper St. Martin's Lane, London, W.C.2

aimed to ‘brighten your life’ and ‘glorify’ your kitchen colour scheme; one could choose from ‘Snowy White, Cotswold Cream, Sherwood Green (chip no. 27 in the bulletin chart), Stratford Yellow, Olympic Red or Everest Blue!’ Colour names aped British successes – from the London Olympics of 1948 to the very recent scaling of Everest. That, combined with the Frigidaire gold crest emblem, made these models those that, the rhetoric suggests, customers would find attractive.⁶³ As fickle fashions changed, so did fridge finishes. Fast-forward to the 1970s and ’80s and you could buy a ‘sapele wood’ finish Tricity or a ‘Copperline’ Electrolux, whose ‘gleaming “copper-tone” exteriors and shining trims’ were ‘beautifully appointed’ to complete the dream kitchen. If you needed further persuading that this was an achingly fashionable fridge, images show it filled with bottles of then very trendy Perrier water. Model name also mattered in a fiercely competitive market. Often they were geared to appeal to a more local market or to hint at the model’s purpose. In France, the French company Frigéavia’s Bretagne model evidently had resonance while the significance and symbolism of Diener’s Chamonix, Megève, Font-Romeu and Superbagnères models (all names of French Alpine or Pyrenean towns) is self-evident.⁶⁴ New names perhaps indicated a new model more memorably than a model number did. Frigéco’s very un-French-sounding Windsor and Commodore were released in France as ‘2 noms nouveaux, 2 nouveaux modèles Frigéco’ (2 new names, 2 new Frigéco models).⁶⁵

Some manufacturers went way beyond just name or colour in selling their machines. Other sales tactics included giving away miniature refrigerator moneyboxes to potential customers in which they could save up for a real one. Frigéco advertised theirs as a family savings tool and a toy for the children: ‘Si un membre de votre famille y met chaque jour 1 NF pendant 35 jours vous pourrez obtenir le Frigéco de vos rêves.’ (If a member of your family puts in one new franc each day in 35 days you can have the Frigéco of your dreams.)⁶⁶ Frigidaire introduced their new ‘Sheer Look’ Imperial range in 1957, fortified by a range of marketing strategies. Their brochures show a carefree housewife, her hands in the air as she gaily revels in the clean lines and spaciousness of her kitchen, complete with all-new fitted appliances in one of a new range of ‘fashion-first colors’.⁶⁷ A film aimed at

This sapele wood finish Tricity refrigerator was deliberately designed to look like a wooden cupboard so that it could be placed outside the kitchen, either to save kitchen space or to provide extra refrigeration in the home.

Frigidaire dealers took the form of a sales ‘pep talk’; a fanfare of music hailing its new Imperial range’s ‘Sheer Look’, with its ‘spine-tingling’ and ‘modern-as-tomorrow’ design. Each appliance, the ad said, ‘merges into its individual setting with the eloquent beauty of rare jewels’, giving women what they ‘want and demand . . . [appliances] radiantly alive with colour.’⁶⁸ Dealers even gave out packets of colour-coated flower seed to match the appliance colours as souvenirs. ‘Modern housewives’ were ‘applying the rules of fashion not only to their clothes but to their homes as well’, according to a contemporaneous Prestcold advert.⁶⁹

Lying behind the ‘fashion-first’ and style-orientated rhetoric of these refrigerator adverts, colours and names were two simple truths. First, these machines were targeted to appeal to the housewife – and it was nearly always the housewife. Why? As women were the main early users of refrigerators they were the ones who really had to be able to imagine these unfamiliar machines fitting into and benefiting their lives, lifestyles and their homes. The numbers of households buying appliances in a spurt of activity in the 1950s and ’60s suggests that they were influenced by their neighbours’ purchases into following suit. By the 1950s and ’60s housewives and families were increasingly inviting these neighbours and other guests *into* their kitchens.⁷⁰ Appliance colour, style and design became as important as what your refrigerator could help you to prepare to serve guests for tea. Second, highlighting style and design over the hygiene and health necessity of installing a refrigerator is indicative of the reality that by the 1960s, consumers increasingly saw refrigerators as a home necessity. They were added onto the wish lists of newly married couples everywhere. The irony is that advertising increasingly highlighted the novel features, colour and style of refrigerators, precisely because they had moved in both the public imagination and in accepted everyday practice from being a toy to a useful tool.⁷¹

4 REFRIGERATOR DREAMS

Flick through a glossy early twentieth-century refrigerator brochure and you would be convinced that it was a simple matter to find space for a refrigerator in your home. A few early adopters evidently did not take much persuading, as this 1919 extract from *American House and Garden* magazine, caricaturing an extremely well-to-do householder's relationship with her new refrigerator, demonstrates:

SHE rang for the butler: 'Wilson, please ask the chef what kind of a refrigerator the architect put in for us.'

'Very well, madam,' and he departed to the kitchen. This same chatelaine did not send for the butler to inquire what kind of an automobile her garage held. Not for a moment! She knew, too, the difference between the Rolls-Royce, her car, and the Ford, or any other car! Yet, she didn't know her refrigerator! Peace – War – the economic structure of nations hinges on the preservation of food . . .

Beyond much doubt the chic porcelain-lined refrigerator of to-day is the corner-stone of the halls of domesticity.¹

For this atypical, fashionable householder her refrigerator was a glamorous status symbol – befitting of her Rolls-Royce, 'champagne' lifestyle. It was enough to show it off as trophy evidence of her wealth and stylishness and leave the everyday running of it to others. In reality, finding the space for a refrigerator within the home was not always as simple for most people as such rhetoric

and the adverts suggested. Refrigerators have to fit not just into real homes but around real lives. Consumers have to justify their incursion into home spaces and everyday practices. Like most new technologies, refrigerators usually entered not a vacuum but a formed, evolving and functioning home. They had to fit into existing spaces and places, jostling for attention and space among the other appliances and gadgets, furniture and functions. This was especially true for earlier models where – unlike Dr Who’s TARDIS – a colossal slab of a fridge enclosed a relatively small interior storage space within thick insulated walls. The ‘chatelaine’s’ refrigerator was probably a large, extremely heavy, two-part water-cooled beast of a machine, demanding the talents of an architect to install it and skill and effort to maintain it.² In 1925 General Electric commented on their own early Audiffren electric machines (at the time the most reliable on the market) that there were very few domestic models installed because of ‘the large floor space required, the excessive weight and the open condenser which combine to make a serious installation problem’.³ Once refrigerators escaped these restraints, being designed as single freestanding units, the refrigerator really could come not just out of the cold but into the kitchen. It is striking that installing a powered refrigerator fundamentally transformed not just the physical layout of houses but how they were used forever. Being able to put it in a *warm* room brought the promise of eradicating from the home ‘unheated, inconvenient and unattractive entryways and closets formerly given over to refrigerators’.⁴

The stand-alone nature of domestic refrigerators, like earlier iceboxes, also impacted strongly on both their aesthetic and spatial fit within the home. Partly because they could customarily be placed in or outside of the kitchen, refrigerators tended to have their own style and proportions.⁵ While from the 1930s refrigerators joined a growing army of streamlined, modern, hygienic ‘white goods’, early models often had an aesthetic firmly stamped with the imprint of the past. In the late 1920s and ‘30s, however, refrigerator manufacturers such as General Electric, Frigidaire and Sears Roebuck spearheaded the introduction of streamlined appliances with a new, clean aesthetic, produced by large manufacturers in collaboration with the most notable designers of the time.⁶ Refrigerators, as the second most desirable purchase after automobiles, were at the front of the queue for a makeover.

REFRIGERATOR DREAMS

Early powered refrigerators like this 1930 Electrolux often had heavy iron hinges and fastenings, wooden or metal carcasses and 'Queen Anne'-style legs, giving them the look and presence of a traditional and reliable piece of furniture, or earlier icebox.



Again General Electric was at the forefront in the redesign process. After initially approaching the industrial designer Norman Bel Geddes, they struck up a fruitful collaboration with Henry Dreyfuss. He worked in close collaboration with General Electric's designers and engineers to redesign the refrigerator in 1935. The characteristic 'cabriole' legs of the earlier models were abandoned and the cooling unit brought inside the main body of the fridge. The 1936 model had a fashionable streamlined front.⁷ Another industrial designer, Raymond Loewy, redesigned the very popular Coldspot refrigerator (originally launched on the market in 1928) for Sears Roebuck in 1935, alongside the refrigerator engineer Herman Price. Their new design also incorporated the first aluminium shelves to be used in a refrigerator. Loewy's expanding industrial design team went on to produce new models annually between 1936 and 1938 – introducing the consumer to the idea that appliances could become stylistically obsolete.⁸ Loewy's role in interiors later extended to designing Air France's Concorde interior in 1975 and inspecting Skylab for NASA to evaluate the quality of life astronauts have in space.⁹

Whichever aesthetic was foremost, refrigerator design was certainly about style. According to trade insiders, 'Women

REFRIGERATOR



Frigidaire cooled box fitted outside the front door, from the 1931 Frigidaire catalogue.

began to say, “Put it in the kitchen – it looks so good.”¹⁰ Loewy’s Coldspot was sold on its design with adverts asking consumers to ‘Study its Beauty’.¹¹ Modern kitchens sometimes feature in Hollywood movies, with 1920s and ’30s filmgoers encountering chic, glossy white refrigerators standing discreetly in kitchen settings on celluloid. Often it was General Electric’s Monitor Top model that received star billing. It appears in Alfred Hitchcock’s 1935 classic *The 39 Steps* in hero Robert Donat’s flat. It also featured in the 1936 blockbuster *My Man Godfrey*, starring Carole Lombard as a rich socialite and William Powell as her new butler charged with serving tomato juice from the modish refrigerator under the maid’s watchful eye.

Consumers were quick to separate these refrigerator dreams from the reality, however, and approached their own kitchens with a much higher degree of pragmatism. The clean, bright exhibition show kitchens of the mid-twentieth century – filled with aspirational brand-new appliances, refrigerators now standard – clearly jarred with the experiences of many visitors for whom sleek upgraded appliances or new cupboard finishes were depressingly unachievable or impractical. Mr Lodge’s family lived in a 1930s two-up, two-down house with ‘no electricity . . . no gas cooker . . . [but] a fire range for cooking’.¹² Surveys carried out at British home shows in the 1940s and ’50s by the Mass Observation organization (charged with studying everyday life in

Britain) also revealed the extent to which these pristine kitchens – even those aimed at working-class families – remained firmly a dream.¹³ On the new white cupboards in a gas-refrigerator-equipped miner's kitchen, one visitor commented that 'things wouldn't stay long like that.' 'The miners won't get that for forty years,' said another.¹⁴

American homes – especially with the growth of the suburbs in the early twentieth century – were spacious enough to incorporate a large refrigerator. While older homes had storage spaces devoted to the production and storage of foodstuffs, linens and so on, new suburban dwellings were firmly spaces of consumption, with an increasing square footage devoted to modern domestic amenities and consumer goods. While the average American house size rose in the early twentieth century, household size was declining equally dramatically, with the number of people living in a household decreasing by 50 per cent between 1881 and 1991.¹⁵ Another refrigerator redesign by Henry Dreyfuss for General Electric reflects these trends. The expanded 1939 model was designed to deliberately dominate a space: 'the radii of cabinet corners and edges became larger, front doors swelled outwards and the tops became more dome-like in an effort to make the refrigerator appear larger and more imposing in visual competition with other makers on the dealer's floor.'¹⁶

The desire for large refrigerators was not replicated in places where space was more often at a premium in the home. In Britain, existing larder space was wired up and given over to the new machine or else the refrigerator was placed somewhere else in the house entirely. Like elsewhere, British kitchen size has waxed and waned over the last hundred years, impacting on the physical fit of refrigerators into an evolving space. In the early days, where a refrigerator *was* purchased to fit in the home, something else often had to be forfeited to fit it into the room. Early twentieth-century kitchens frequently had no space for a refrigerator at all, leaving households reliant on the more familiar tried and tested traditional methods of storing food. The reality was that bulky American-style machines were harder to accommodate into smaller homes elsewhere. This was especially true for the UK and those European countries where of-the-moment 1920s and '30s built kitchenettes only allowed one or two appliances to be fitted.¹⁷ These smaller kitchens often took

the form of a tiny space built off the main living space or a relatively cramped galley kitchen.¹⁸ Such layouts usually assumed that the kitchen was solely a functional working space with no place either physically or metaphorically for leisure. As a result they were designed to be as compact as possible, minimizing labour by reducing movement around the room.¹⁹ Early on, this greatly hampered the uptake of domestic refrigerators, which were habitually a close third on the housewife's appliance wish list behind cookers and washing machines.²⁰

The 1930s saw the beginnings of a reversal of this trend in new build houses, which were increasingly designed to allow for a raft of new powered appliances – refrigerators included. Refrigerators were fitted as standard in aspirational show houses, such as the Electrical Association for Women's high-profile and explicitly modern Art Deco-style show house in Bristol.²¹ In the British suburban sprawl of 1930s 'Metroland' and the streamlined, clean-lined new builds influenced by the continental modernism of Le Corbusier, the ideal kitchen was a roomier space – one in which it was envisaged that a housewife would be happy to work and a family to eat. Moving into one of these well-equipped and fully 'wired up' (and plumbed in) homes was, according to the expert on the 1930s Greg Stevenson, 'a move into the modern world'.²²

The reality for the vast majority of mid-century households in Britain and Europe was that they had no refrigerator. This was despite the growing availability of smaller, user-friendly models; the planning ideals and touting of new domestic technologies as tools of modernity; the hard sell of manufacturers; and the growing number of homes wired for electricity. The modernist kitchen was achievable for very few dreamers and the prolonged and profound fissure between refrigerator dreams and reality in the British home existed well into the second half of the twentieth century. While the American 'Mr and Mrs Homemaker' during the Second World War were being encouraged to 'make 'em last' and eke out the life of their old refrigerator in support of industry's new focus on the war effort, contemporary British families were still reliant on the larder.²³

The contrast was not lost on the British public. 'Well, there should be refrigerators. They have them all over America,' commented the occupant of one house in Fulham, London, in

REFRIGERATOR DREAMS

Kitchen from the Electrical Association for Women's 1935 all-electric house, Bristol. The show house sold within a week of opening.



1943.²⁴ Percentage wise, while 50 per cent of U.S. households had a refrigerator by 1940, this had risen to 85 per cent by 1944. In the United Kingdom only 5.3 per cent of households had one in 1953.²⁵ Reminiscences from the period make it clear that most had refrigerator-free childhoods. There was 'no fridge, so you had what you call a meat safe with a gauze front and everything that was meant to be cold went in there,' one woman recounted. Another remembered: 'we had . . . [a] pantry and larders and ours was under the stairs . . . it was cold and it had a slab and everything went into it.'²⁶ Larders were not always located near to the kitchen. Many homes in Bourneville had larders in the sitting room, while others in council housing in London found that they had to walk down a long corridor from the kitchen



to reach their larder.²⁷ Another resident of a London County Council flat in Roehampton saw a great divide between households with and without a refrigerator: ‘There should be places where a working man can keep his food, what d’you call them? Refrigerators. Big houses have them, why not workers’ houses?’²⁸

Where homes did have refrigerators, they often coexisted in the space with other cooling technologies in a way completely unfamiliar to us today. A refrigerator was only an addition to a house’s armoury of food storage and preservation methods in the mid-twentieth-century home. It only needed to be large where there was no larder.²⁹ Raymond Bird remembered clearly the family’s first refrigerator in the 1930s, bought second-hand by his mother ‘who was forward looking in this sort of thing’.³⁰ It was ‘only a very small refrigerator, not more than a foot by a foot by a foot and didn’t hold very much . . . we hardly ever used it strangely enough. We had a cool larder.’³¹

Even before the Second World War had ended, post-war planning for housing was well underway in Britain. Government departments, organizations like the Electrical Development Association and publications like *Good Housekeeping* magazine

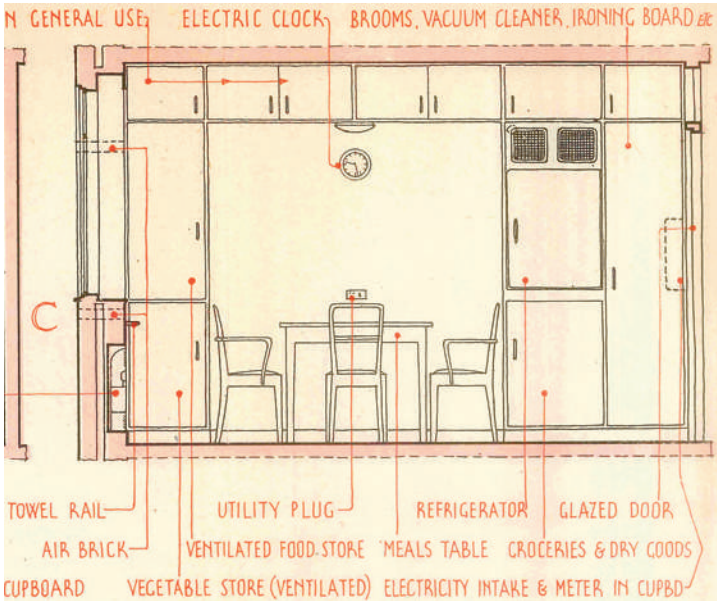
An Ortyx gas kitchen, photographed on 28 July 1945, shown at the *Daily Herald* Post-war Homes Exhibition. The refrigerator can just be seen on the far left.

all offered the fillip of a post-war glut of domestic appliances (refrigerators included) to those who had survived wartime privation. For the first time, most of these new kitchen layouts featured refrigerators. They were inspired by kitchens such as the working-class one designed for the All-Europe House displayed at the 1939 *Daily Mail* Ideal Home Exhibition.³²

Usually there was an explicit agenda behind the plans. For example, the BEDA's kitchen layouts all featured an electrical refrigerator as standard, usually as part of a kitchen triangle formation (still familiar today) in which the housewife could move efficiently between refrigerator, cooker and sink.³³ It set out a strong statement of social intent, quoting the then Minister of Reconstruction Lord Woolton's vision for post-war housing, where new technology would reign supreme. Mass-produced 'labour-saving devices' would turn the home 'which for the poorer people has so often been a matter of domestic drudgery . . . by the use of science . . . into a place where a woman has leisure and pleasure'.³⁴ The extent to which this labour-saving remit was achieved has been the subject of much debate.³⁵ Powered appliances have

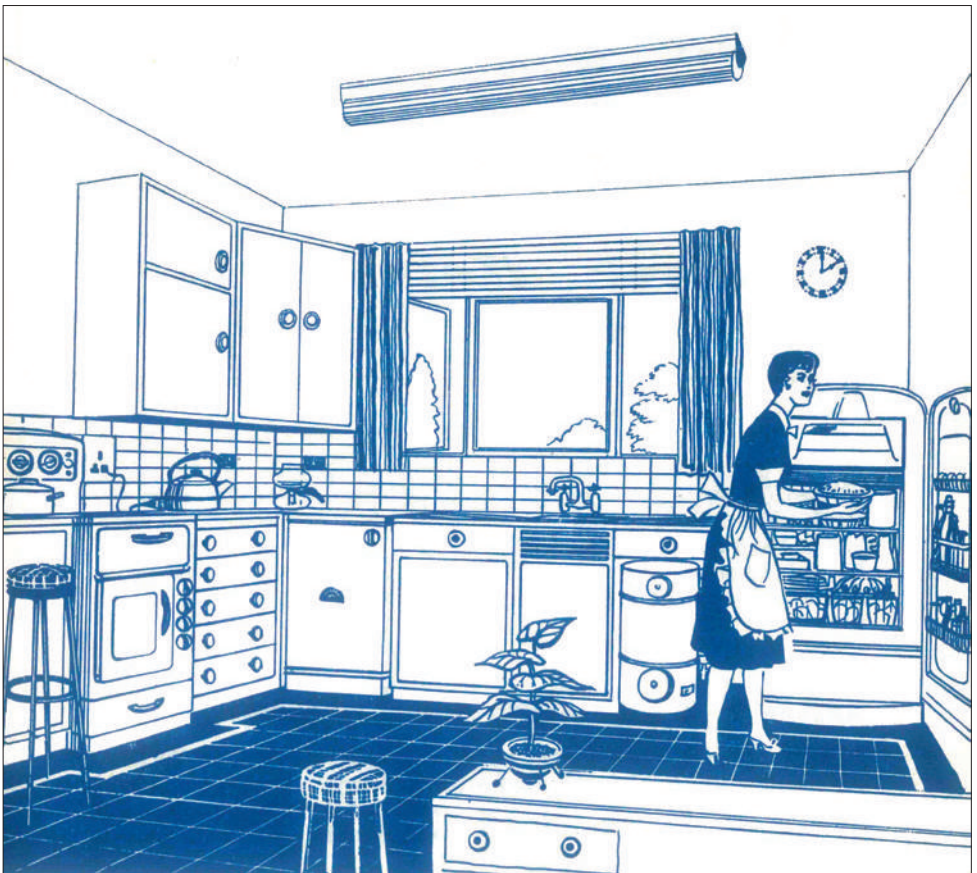
Chinese visitors to the *Daily Herald* Post-war Homes Exhibition in 1945. They were shown around this gas kitchen by Lady Stafford Cripps in 1945. Lady Cripps was president of the British United Aid to China Fund during the Second World War and wife of leading labour politician Sir Stafford Cripps.





Design for post-war housing, including a sketch of a kitchen and a side-on view of a kitchen for a flat including an electric refrigerator, from a 1944 BEDA publication.

Drawing from the EDA publication *The Art of Cold Cookery* (1960).



REFRIGERATOR DREAMS

In this 1950s *Daily Herald* cartoon a woman takes it easy as her modern labour-saving appliances do all the work.



undoubtedly dramatically reduced the sheer physical drudgery of much housework throughout the twentieth century. New appliances also gave women freer routines than those of their mothers. With a refrigerator, shopping didn't have to be a daily chore; with a washing machine, the traditional Monday washday gradually fell away. This was evidently true for Mrs Morrison, a mother and housewife in the late 1950s and early '60s. Although life with her children was busy, with a lot of time spent shopping, washing and cleaning, she was spared some of what would have previously been daily tasks: 'On some mornings . . . I would go down to the butchers or fish shop . . . And then in the afternoon I would take them [the children] out to the park.'³⁶ The counter argument is that, alongside this, expectations of levels of cleanliness and the sophistication of some of the tasks involved in maintaining the house have risen, mediating against the impact

of powered appliances on the time and energy required for household chores.³⁷ A survey conducted by Mass Observation of women in suburban London in 1951 reported back that they spent an average of 71 hours per week on domestic chores.³⁸ But despite some evident initial doubts about the possible utility of new appliances such as powered refrigerators, most householders were more than keen to accommodate them in the home. The hope that they would be time- and labour-saving, although slow to materialize, eventually became a reality. By 1964 *New Look* magazine could ebulliently comment that ‘The female kitchen is the temple of those twin symbols of the new life – the refrigerator and the washing machine.’³⁹

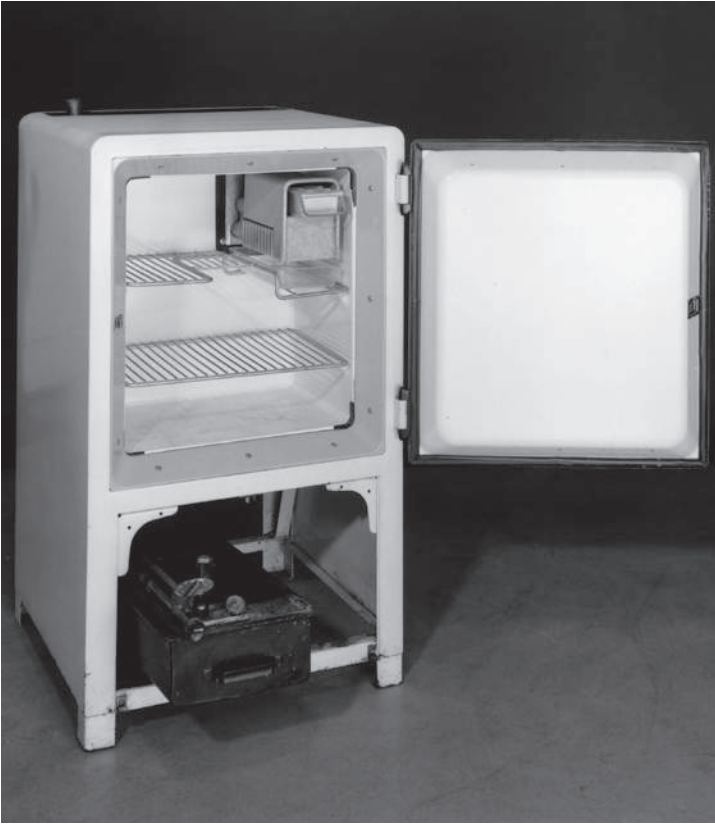
The influential Good Housekeeping Institute also took this view, outlining in pragmatic fashion how kitchens should be organized to make them ‘as efficient and pleasant as possible’ to work in.⁴⁰ Their popular *Book of Good Housekeeping* featured modern refrigerator-equipped kitchens: a large ‘upgraded’ free-standing model features in a floral wallpapered American kitchen as a ‘revolt against the all-white, clinical “laboratory” kitchen’ while smaller fitted ones appeared in photographs of British and Swedish homes.⁴¹ In France, the Ministère de la Reconstruction et de l’Urbanisme (MRU) set up a competition in 1947 for new (social) housing design. Their brief set out a number of ‘Equipment Norms’ which were seen as essential for new dwellings, including a minimum of one outlet for electricity and hot and cold running water – both luxuries at the time. It also optimistically asked that refrigerators – owned by only 5 per cent of French households at the time – be included in kitchen layouts, anticipating an uptake in future purchases.⁴²

Even when manufacturing did take off again after the war, you were unlikely to get a refrigerator, unless you were royalty. Most British goods were destined for export. The predicted glut of appliances, refrigerators among them, was not forthcoming, prompting the nicknaming of the 1946 ‘Britain Can Make It’ exhibition as the ‘Britain Can’t Have It’ exhibition, despite the burgeoning catalogue pages that displayed a whole raft of modern appliances, fixtures and fittings – Electrolux refrigerators prominent among them. Apologetic manufacturers explained to the public:



This 1955 kitchen features laminated cupboards and bright red accessories as a housewife's 'revolt' against the laboratory kitchen.

REFRIGERATOR



Small refrigerator by Electrolux Ltd, Luton, operating on paraffin of the type commonly used in post-war prefab houses.

let's face it . . . we know you're disappointed. We too had hoped you'd have one of the fine post-war Prestcold Refrigerators by now, for we're making them in their thousands. You would have too, but for export . . . But there are a *few* for home needs.⁴³

American householders were similarly disappointed. Despite the wartime promises of peace-time consumer products, they were slow to arrive. The appliance industry was going 'Nowhere Fast', the journalist J. Saunders Redding pronounced in 1946. 'What the public wants is to see the cars and refrigerators and washing machines rolling off the assembly line again. They no longer care very much who gets licked in this fight.'⁴⁴

Refrigerators did however make their way into post-war British homes in a high-profile way via the small number of prefabricated homes built as much-needed temporary housing under the official post-war building programme.⁴⁵ The first prototypes, including the steel-framed Arcon model alongside

the timber-framed models and the aluminium-framed AIROH, went on public show in the spring of 1944 at the Tate Gallery, London.⁴⁶ The very lucky (very) few who moved into prefabs became the proud inhabitants of a home in which everything was new. Nellie Rigby vividly recalled visiting her prefab with husband Rob in 1946: 'it was a roasting hot day, we . . . walked in and just, just couldn't believe it . . . we was so, so excited . . . looking at the fridge and the cooker'.⁴⁷ Ex-Labour Party leader Neil Kinnock's parents also moved into a prefab, which, as he recalled, 'had a fitted fridge, a kitchen table that folded into the wall and a bathroom. Family and friends visited to view the wonders. It seemed like living in a spaceship'.⁴⁸

Refrigerators were finally something more householders could aspire to owning, encouraged by the public exposure they were given in post-war prefabs.⁴⁹ Military personnel also came back from abroad having had a taster of refrigerator ownership during their service, as Jane D. recounts. Her father was about four when his family were posted out to Singapore with the British Army. She recalls his 'astonishment at having a fridge

Refrigerator in a mid-20th-century army home in California.



in the army family lodgings' while in the British Army School in Singapore they were given cold flavoured milk from the 'fridge'.⁵⁰ They returned to Britain in 1955 to find that none of their neighbours owned one yet.

Householders in the 1950s were also aided in their dreams of refrigerator ownership by the mass media. In the USA, popular TV offerings like *The Donna Reed Show* featured refrigerators in domestic settings, promoted 'as pioneering elements of a new and promising future'.⁵¹ In Britain, a 'Coldrator' refrigerator featured on the world's longest-running (radio) soap opera *The Archers*, purchased by main characters Dan and Doris Archer.⁵² *The Archers* was set up in part as an educational programme reflecting real life in the country and Dan and Doris's refrigerator gave a clear signal to the rest of the country that the wartime 'make do and mend' ethos and post-war austerity were finally coming to an end. Avon reps in the USA revealed how their work enabled them to earn enough to live the American dream – purchasing all sorts of luxuries, including refrigerators. Such part-time work was not seen as 'real' work, but although the income from it was viewed by the household as 'pin money', it paid for luxuries such as refrigerators.⁵³ A 'new automobile, the electric refrigerator, a vacuum cleaner' contributed towards to 'my family's happiness' said one American householder'.⁵⁴ As figures from 1960 show, the percentage of households with a refrigerator varied widely from country to country – from 97 per cent in the USA to 80 per cent in Australia; 50 per cent in the Netherlands; 3 per cent in Belgium; and only 17 per cent in the UK.⁵⁵ By 1965 the UK figure was 56 per cent – nudged by a couple of hot summers and the fact that the number of married women in paid employment doubled in the ten years to 1958.⁵⁶ The consumer revolution identified by *The Economist* in 1959 brought a changing mindset. Instead of having a 'little more money for beer, baccy, pools and the dogs', people were purchasing 'mechanical slaves on the hire-purchase'⁵⁷ in, as prominent Labour politician Hugh Gaitskill saw it, an 'Americanization of outlook'.⁵⁸ Refrigerators were evidently a key part of the transformation in the living standards of 1950s and '60s households. They also transformed habits and had the potential to give British women more freedom than their ancestors would have dreamed of experiencing. British housewife of the 1950s and '60s



Refrigerators on display at the 1959 Soviet exhibition in Moscow. It was held in close proximity to the American National Exhibition, which was the site for the famous Krushchev-Nixon 'kitchen debate'.

Christine Fagg found the new powered kitchen appliances in her home invaluable in giving her free time, as she 'wanted to desperately do things outside the home'.⁵⁹

Sometimes the adoption of one home technology necessitated the adoption of others. Refrigerators were becoming essential as houses were increasingly built without larders or were retrofitted with central heating. Frances Soar remembers that 'having got the central heating, we then had to get a fridge . . . because the food started going off in the pantry.' New build homes and new towns prompted by the 1946 New Town Act had fitted kitchens with space for appliances galore. Building companies such as prefab contractor Taylor Woodrow also fostered modern kitchen and house design in the 1950s – offering a housewife's dream open-plan kitchen in 1956. This included 'the most up-to-date of refrigerators', set at eye-height in a bank of other fitted cupboards, a 'scarlet Formica' breakfast table and even an electric clock on the wall.⁶⁰ The 'dream kitchen', however, was not a dream for all. Some households were especially resistant to moving to a modern fitted kitchen – working-class households



often preferring to maintain the more traditional layout of back room and front (best) parlour room if possible. New guidance on social housing proposed whole-house heating and *no* larder.⁶¹ Considering that average internal house temperature in Britain rose from 12°C to 18°C between 1970 and 2004, refrigerator purchase was essential.

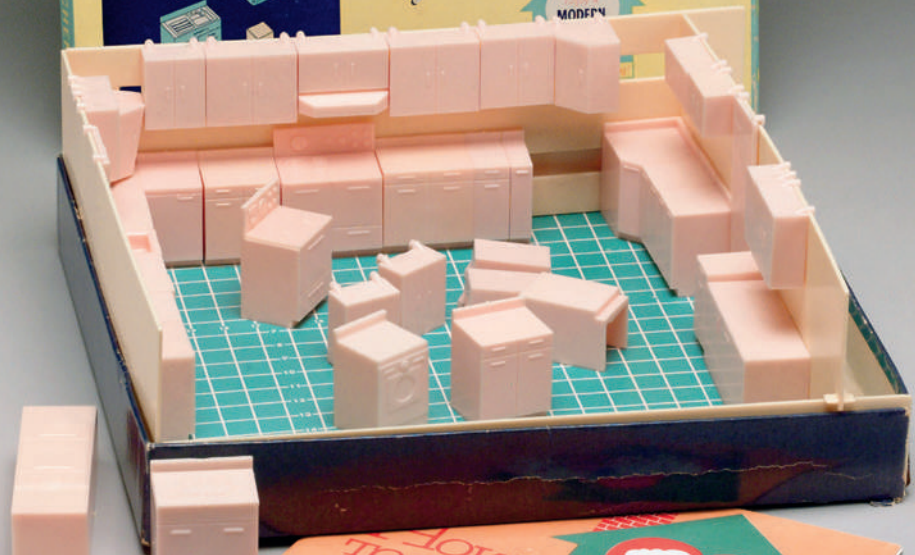
No longer a tagged-on addition, refrigerators were increasingly part of planned kitchens with work surfaces and appliances in standardized dimensions. Although old and new appliances sometimes coexisted uneasily in the kitchen space, newly married housewives were encouraged to start ‘from scratch’ because the newest appliances were ‘likely to be the best’.⁶² Some purchasers did precisely that. Mr and Mrs H. bought their complete large U-shaped fitted kitchen in 1950 after having seen it at the British Industries Fair. It embraced cutting-edge trends for colour and integrated appliances with a double-fronted refrigerator and cooker all hidden behind pale green plastic-fronted facings. Even the tiles and clock were coordinated in green.

American householders had even more choice. Marketing kits like Con Edison’s ‘Plan Your Kitchen Kit’, shown here,

Mr and Mrs H.’s original 1950s luxury fitted kitchen, seen here displayed at the Science Museum. The integrated double-door refrigerator is under the mock window.

Con Edison, ‘Plan Your Kitchen Kit’. Despite the implication given by the illustrations that the kit empowers women to design the kitchen that suits their needs, this ‘toy’ is fundamentally a sales device to encourage women to choose an all-electric kitchen.

Con Edison's
**PLAN YOUR
KITCHEN
KIT**



helped affluent American housewives to design their own new kitchens. The family dynamics at play are explicit in the kit's box and instructions. On the front of the box a woman's hand is shown placing the pieces in the kitchen. In the instruction leaflet 'How to Get the Kitchen you Want', the husband benevolently oversees the housewife's planning activity – the presumption is that he will be paying. The play element enabled aspiring buyers with the help of 'an obliging salesman' to visualize their own dream kitchen space more clearly, the added tactile element of handling the toy appliances and units encouraging them to purchase and turn dream into reality.⁶³

However, it is worth remembering that for some households even having a larder in the 1950s was a vast improvement on their living conditions. While American families were being encouraged to upgrade and 'move out your old refrigerator',⁶⁴ housewives resettling from urban Bethnal Green in London to new housing estates in rural Essex were excited about swapping a set of damp, cramped nineteenth-century shared rooms and cooking facilities for a new house complete with a 'real kitchen with a sink and a larder'.⁶⁵ For many 1950s households, the kitchen was first and foremost where meals were cooked, but was also still the place where clothes were laundered, bodies

The Kerr family, seen here, occupied two tiny rooms in Glasgow, c. 1930. The small kitchen is equipped with a range for cooking and heating water for washing, and a sink for washing up.



were washed and many functions of everyday living occurred.⁶⁶ Kitchens in households headed by a 1950s war widow or bachelor, the poorer households purchasing their machine second-hand or on hire purchase, were all far removed from the dream kitchens depicted in advertisements or on show at the Ideal Home Show.⁶⁷

Some refrigerators were targeted at the space-poor kitchen and the resource-poor household. The CannonLux was touted as being the perfect answer to accommodating appliances in a small kitchen, 'specially styled for the family flat, bachelors of both sexes and anyone who . . . finds space is limited'.⁶⁸ Other refrigerators were specifically designed to be flexible enough to fit most spaces. This included the award-winning 1959 Prestcold Packaway, which fitted under standard British worktop heights and had hinges that enabled the door to be opened within its cabinet width. It could also be hung on the wall where space was particularly scarce. Designers C.W.F. Longman and Edward Wilkes were, following American fashions for fitted kitchens, providing a more unified kitchen appearance rather than a 'miscellaneous array of unrelated items'.⁶⁹ Interestingly the refrigerator was designed to be unobtrusive: able to 'take its place among other kitchen cabinets with only the restrained name plate to give it identity'.⁷⁰ This is a machine that, unlike many of its predecessors, did not feel the need to overtly assert its identity or its claim on kitchen space or the consumer's wallet! Despite its forward-thinking design, the gendered assumptions about its use remained. The *Prestcold Post*, reporting on the installation of Packaway refrigerators into modern flats, quoted one husband whose wife 'finds the Packaway a very handy addition to her kitchen'. Housewives at the time who had taken the trouble to write also featured in the newspaper, reporting back favourably on the years of 'trouble-free' reliable service Prestcold refrigerators had given them in their 'Pre-fab' homes.⁷¹ The Packaway also embodied the typical style of 1950s 'sheerform' appliance design, characterized by a sheer, square look, which apparently began with refrigerators. Typical sheerform appliances had a slightly raised base to give them a 'floating' look, together with a box shape, (sometimes) textured panels and fairly minimal and flush knobs and handles.⁷² Their flat tops were designed to fit under the kitchen worktop or offered an extension of the kitchen surface for storage purposes. This 'sheer look' was embodied



REFRIGERATOR DREAMS

This Prestcold Packaway D301 was designed to fit into small spaces, c. 1959.



in American Frigidaire models in the late 1950s, their smooth, flat-topped machines designed for the fitted kitchens becoming popular at the time.

From the 1970s, the introduction of fridge freezers hampered this sleek approach to kitchen and appliance design, necessitating the hacking up of some work surfaces to make them fit. Installing a bulky chest freezer with a large footprint was even more difficult. In a move reminiscent of accommodating those bulky large early refrigerators, householders sometimes had to find them a space outside of the kitchen. Alternatively large refrigerators were increasingly hidden away behind colourful kitchen cabinets. Typical of the way in which this was done was Jennie and David Hillman's 1980s kitchen featuring the then in-vogue colour scheme of black, white and stainless steel with

Typical small galley kitchen, this one belonging to *Doctor Who* actress Carole Ann Ford, seen here with her daughter in 1964.



a splash of red. All their Zanussi appliances were housed behind black kitchen unit doors. Their kitchen oozed a very deliberate sense of style: 'if it's not black, white, red or stainless steel it's just not bought!'⁷³

Refrigerators often fitted awkwardly into the home, not just physically but in terms of everyday living. Mrs P. remembers purchasing the family's first fridge at around the time that the Crouch House with its modern family kitchen was exhibited at the 1965 Ideal Home Exhibition, shown here. Bought for the tiny kitchen of their cramped rented one-bedroom flat in North London, it had insulated 'walls so thick we couldn't fit much inside'. When the compressor motor kicked into action 'it was so noisy it made the whole flat shake', disturbing everyone's sleep at night.⁷⁴ But despite such problems, the benefits of refrigerator ownership evidently strongly outweighed the disadvantages – in terms of expense, space (or internal lack of) and noisy operation.

Refrigerator ownership brought new responsibilities, as they had to be operated correctly, maintained and repaired. Tacit inherited knowledge, relied upon for more traditional methods of food storage, was absent in the case of these new machines.

Mrs Jill Thompson proudly standing by the new chest freezer in her dining room, 1970.

Frankly, early refrigerator adopters had just as steep a learning curve as someone buying their first smartphone today. Monica Dickens, employed as ‘cook-general’ in the 1930s, recalled a visit from the gas man who ‘solved the mystery for me of why the ice in the fridge was always melting’, and ‘roared with uncouth laughter when he realised I didn’t know that one had to keep the door shut’.⁷⁵ Despite the exhaustive instruction manuals supplied with refrigerators and the important educative role played by gas and electric company appliance demonstrators through much of the twentieth century, there is plenty of evidence to suggest that these were often ignored, misunderstood or sometimes deliberately subverted. One inventive 1930s refrigerator owner used sheep droppings from his flock to produce the methane needed to power his gas refrigerator.⁷⁶ Housecraft advisor Ann Smith found a more common type of misuse when she visited some council flats in the 1950s. She found that only three out of eight refrigerators were running. The others were being used as storage for the family’s clothes mending. Sometimes plugged-in refrigerators were not even used, cooling empty interiors, while milk was left out on the side. The *Prestcold Post* evidently didn’t feel it was too ridiculous to headline an article with ‘A Refrigerator is More than a Store Cupboard’ in 1961.⁷⁷

Kitchen in Crouch House show home at the 1965 Ideal Home Exhibition, photographed by Tony Eyles. Designed to look like a lived-in kitchen, it featured standard-height work surfaces and modern finishes and was dressed with modish accessories such as a bread crock complete with French baguettes.





Promotional photograph of a woman cleaning the exterior of her Hotpoint refrigerator, c. 1955.

Using a refrigerator was not seen as a masculine practice in the first half of the twentieth century. If you believe the adverts – the vast majority of which show women planning kitchens and choosing and operating refrigerators – men were effectively ostracized from refrigerator use, the machines wresting away a degree of (hu)man control.⁷⁸ Men *other* than the head of the household repaired refrigerators, their increasingly complicated and hidden mechanisms requiring a specialist touch. It was women who were usually portrayed (in adverts and manufacturing industry brochures) as the ones maintaining their refrigerators: cleaning the innards, organizing food contents or repairing the enamel finish. The comedic element in the 1968 film *The Odd Couple* comes from the disjuncture and friction between the two male flatmates: the quirkily over-clean Felix (Jack Lemmon), who performs the unexpected, feminine role of housekeeper, and the unreformed, masculine and messy Oscar (Walter Matthau), who leaves unidentifiable green and brown sandwiches in the refrigerator. Although refrigerators were widely viewed as providing better food access for all members of the family apart from the very smallest child, women were quite evidently meant to be the main users. It was also women, according to the adverts in *Paris Match* and other magazines in the 1950s and '60s, who served male foodstuffs – most obviously alcoholic drinks – straight from the refrigerator to their menfolk, often seen reclining in chairs, presumably after a hard day's work. If you don't think most beer adverts are aimed at men, just Google them and see for yourself. In a 1950s advert for a Servel refrigerator a besuited man could manage, however, to fetch ice cubes from the refrigerator to cool his drink, while in another Servel advert from 1953, a man is showing his wife how the ice-cube-making process works. Evidently a *few* products were cool enough for men to fetch themselves. Today even yoghurts have been developed which purport to meet the 'needs of active men' – an interesting twist on the main line of dairy advertising, which features women consuming these products.⁷⁹

Despite the earlier ambivalence and mistrust even about the place of refrigerators in homes and lives, the degree with which they have become accepted into the home is reflected by their regular anthropomorphism or zoomorphism within Western culture. Richard Hoffman's poem 'Refrigerator' encapsulates this nicely:

REFRIGERATOR

Old white conserve-
ative, it grumbles,

shudders in its sleep,
and dreams of snow, of
white bears shaking
themselves dry and
rolling on their backs.

When move it must,
it resembles a giant
penguin.

Soft avocadoes,
rubbery artichokes,
bad meat, black bananas,
milk gone sour,
and waxen cheese,

are not its fault.
We are to blame,
with our capricious
hungers.⁸⁰

As a museum curator I am offered a lot of old refrigerators and the language used in these offers is often striking, ascribing a variety of human or animal attributes and behaviours to these machines. The donor will say how sad they are to see the fridge go; will comment on how it has ‘served them faithfully’; express that they want it to go to a ‘good home’ (as in the case of ‘Ethel’, a 1950s Hotpoint refrigerator offered to the Science Museum recently). Part of the evident attachment between owners and machines can be ascribed to the usual longevity of older refrigerators. Being built to last, they are often long-standing fixtures in the home, becoming a familiar feature and associated with household memories, events and the evolving landscape of household life. In the words of blogger John LaRue:

A dear friend of mine passed away the other day . . . In my toughest times, my friend was always right there with a cold beer.

When I wanted to grab a bite to eat, my friend knew just the right meal. And no matter how hot-tempered I was, my friend always stayed cool. That's because my friend was a refrigerator.⁸¹

Similar strands of rhetoric appeared early in the twentieth century, too. Although refrigerators were then brand new to the home and technologically cutting edge – not the familiar friend they are often viewed as today – they were often advertised as a ‘housewives’ friend’ or ‘tireless servant’.

But there is more than sentiment and nostalgia to such anthropomorphism. Recent Japanese research revealed that people who were instructed by their refrigerator telling them what to put inside were more likely to listen to the machine and follow its instructions if there was a pair of expressive robotic eyes on the refrigerator. This eye contact with the machine with a friendly face made it more likely that the encounter and instructions would be remembered. The hope is that such more humanized machines might be able to help the elderly and physically impaired to function more independently in their own homes.⁸² No surprise then that, although it hasn't made it into space, a more friendly look was considered for a food refrigerator designed for potential use aboard the International Space Station: with a proposed food tray featuring a ‘cartoonish, anthropomorphic figure’ – designed to be a comforting presence so far from home.⁸³

Cast your mind back to the ‘chatelaine’ we met at the beginning of the chapter. If you could visit her kitchen today it would be as unfamiliar and alien to us as ours would be to her, in terms of both the form and features of appliances – refrigerators included – and their social meanings. Today, the kitchen is often the receptacle and showcase for a homeowner's high-tech technology and smart appliances and frequently a sociable place; a hundred years ago, it wasn't somewhere any ‘respectable’ well-to-do homeowner often visited, and it ‘languished as a marginal place, populated only by servants or the poor’.⁸⁴ For the relatively wealthy it remained rarely visited territory, buried at the back or in the basement bowels of the house. One aspect of the chatelaine's refrigerator would be familiar, however. For her it was a trophy item, representative of aspiration and the image she wished to present to the outside world. Over the past sixty years

overleaf

Twenty-first-century kitchen with an integrated fridge freezer hidden behind cupboard doors.

Adrian and Rosie's well-stocked fridge freezer located by the back door. Hidden next to it is a fashionable pull-out larder.

Iris's fridge holds her magnet collection.

London cake shop with its essential appliance: a Smeg.





The large refrigerator room at the White House in America, c. 1990s, photographed by well-known architectural photographer Jack Boucher for the Historical American Buildings Survey.



Refrigerator incorporated into office space.

REFRIGERATOR

the centre of gravity in the kitchen has noticeably shifted again from refrigerator, to cooker and back to the refrigerator again – increasingly the star attraction in the room. A friend recently purchased a statement American-style refrigerator – black and slab-like – unsettlingly resembling a thicker version of the giant monolith in Stanley Kubrick's *2001: A Space Odyssey* (1968). What about the rest of the kitchen? Well, it will now be re-planned around the fridge.

Refrigerator ownership has moved a long way from Raymond Bird's 1930s 'hardly ever used' refrigerator. Apart from being highly functional and process-driven spaces, kitchens have increasingly also become places to dream, socialize and hang out. They may be furnished with the latest refrigerator (full of food purchased for recipes from lifestyle cookbooks), as much an image of aspirational living as any exhibition show kitchen. Kitchens are, as they always were to an extent, places of display. The gadgets on show, the kitchenware and the refrigerator model: in the 1920s and '30s, a gleaming Monitor Top, gas-powered Electrolux or streamlined Raymond Loewy Coldspot refrigerator; today a retro-style Smeg, a statement double-fronted wooden Italian model with porthole windows or a model

'Two Women and a Teenage Boy in a Kitchen, United States, 1972' – a photograph by Tony Ray-Jones of an American family kitchen.





Domestic kitchen with a roomy fridge for all the family.

with extra features such as a built-in bottle fridge, water cooler or Wi-Fi technology. In India, where only one in four households own a refrigerator, they are also highly aspirational items for the home. Tailor Santosh Chowdhury's family, having saved for ten years to purchase the family's first refrigerator, was the first in their village to do so. They are part of a growing trend towards refrigerator ownership on the subcontinent, where rising incomes are enabling them to spend money on such goods.⁸⁵

What is certain is that over the past hundred years refrigerators have gradually become ever more embedded into our homes, both physically and in our everyday practices and culture. Once it had proved its worth and earned its place and space within the home and the household, the refrigerator was here to stay. It is currently hard to imagine it being deposed as king of the kitchen by another appliance. Refrigerators store and cool our food, drink, nail varnish, baby food, medicines, fishing bait and exotic pet food. Refrigerators even became a hot news topic in Britain's 2015 General Election. Newspaper commentators and public alike lined up to critique the model

REFRIGERATOR

and the contents of then incumbent Prime Minister David Cameron's trophy fridge as a fair reflection of the family's status, aspirational lifestyle, design acumen, brand awareness and shopping habits. Within the home, a fridge is not just a fridge and never has been.

5 ANATOMY OF THE REFRIGERATOR

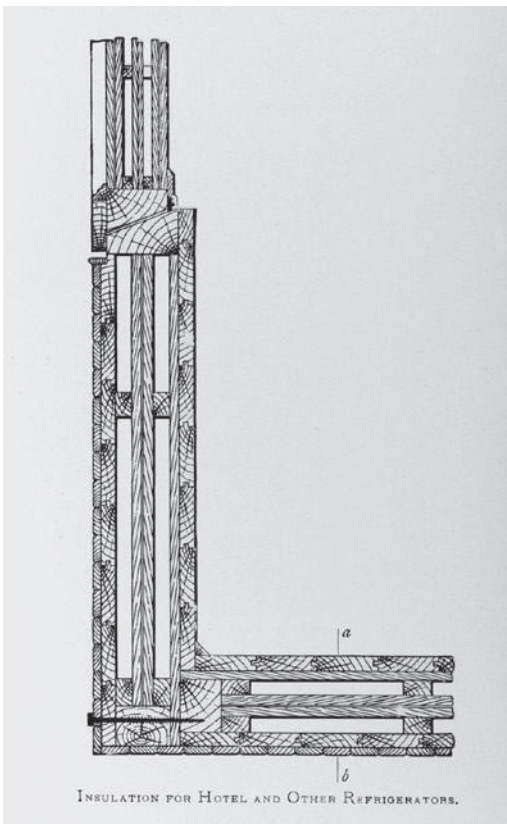
Why does the refrigerator look, sound and feel the way it does? Most people don't think about this at all, mentally registering little about their refrigerator; perhaps its colour, size, which way the door opens or what energy efficiency rating it is. Most of us certainly don't consider *why* it looks as it does: why it has a certain exterior finish (glossy white), where the pipework is or why there are shelves inside the door. It just *is*. Today's refrigerators are designed with a set of sophisticated user-friendly features as standard. The gradual evolution of the fridge's architectural features over the last hundred years, adding novel features and tweaking well-established ones, signals both a settling down and an evolving sense of what a refrigerator should be like and how it should function over time. But in the early twentieth century many refrigerators were not manufactured with the needs of the consumer in the forefront of designers' minds. Some early machines were fairly unsophisticated: their mechanical nature was very evident from the unconcealed snaking refrigerator pipework, for example. The engineers of these early machines were more concerned with how to accommodate the bulky compressor and motor in the machine and how to most efficiently and easily manufacture its outer shell than with where to put the door handle.¹

Design, aesthetics, user experience, manufacturing ease and imperative and a degree of trial and error have all steered refrigerator design, sometimes with a degree of friction between competing priorities.² Gradually a set of other internal features

REFRIGERATOR

and external finishes generally accepted as useful emerged. Shelving in refrigerator doors first appeared in the 1930s, while fridges also gained crisper drawers for salad and internal lights that magically came on when the fridge door was opened around the same time. A thermostat fitted to control internal temperature was even present on the earliest electric refrigerators such as the American Fred Wolf's *DOMELRE*. An easy-to-clean synthetic or porcelain enamel finish, ice-cube tray and freezer compartment were also generally considered useful early on and continue to be fitted today. Although all of these features are now standard, each has their own particular story of invention and adaptation to tell, designed at particular times for particular reasons. This chapter looks at the introduction of some of the refrigerator's now taken-for-granted features and the impact they have on user experience.

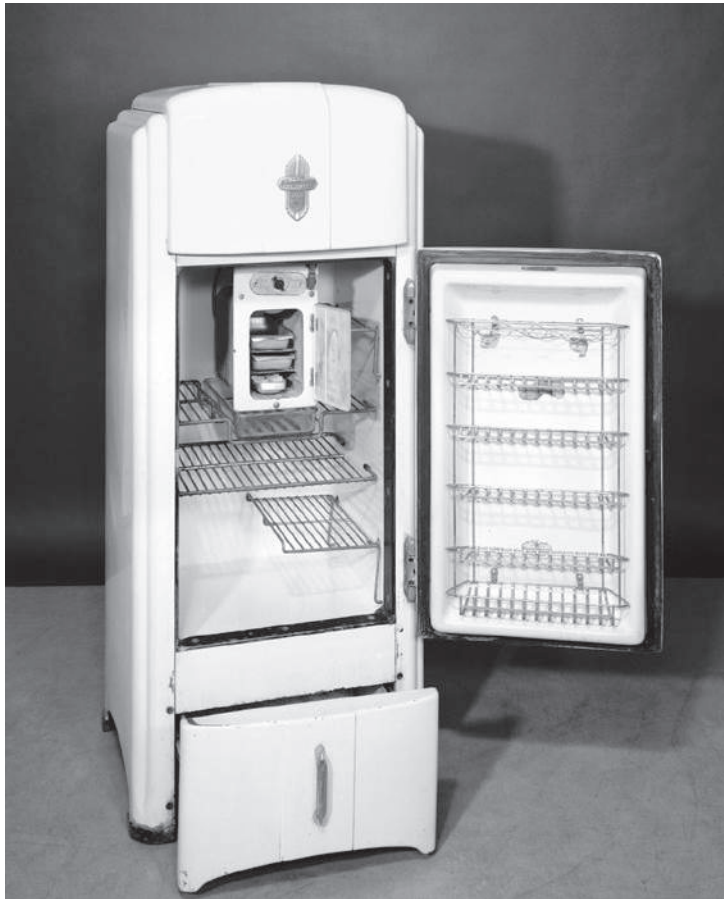
Shelving in refrigerator doors is such an obvious feature to include today that it is hard to appreciate just what a revelation



De La Vergne
Refrigerating Machine
Company catalogue
image showing just how
many layers made up
the insulated walls of
their refrigerators.

ANATOMY OF THE REFRIGERATOR

it was when it was first introduced in the 1930s. The doors of early refrigerators were necessarily thick and solid to ensure good insulation and little thought was initially given to the other uses that could be made of them. In the early 1930s one woman, Constance West, inspired her inventor husband James to procure a patent for shelving inside the refrigerator door. He approached many of the major refrigerator manufacturers including General Electric and Frigidaire, none of whom were interested in the idea. Finally Lewis and Powel Crosley Jr (owners of the Crosley Radio Corporation and better known for their radios and cars),³ who were in the midst of developing new features for their refrigerators, recognized its potential sales-generating importance and bought the patent from him. With shipping dates to meet and with no time to redesign the door, Crosley engineers simply knocked out the door shape enough to accommodate shelves



Crosley Shelvador refrigerator, 1930s. This streamlined refrigerator was the first to house shelving within the door itself.

inside. The Shelvador was launched in February 1933, immediately becoming a best-seller.⁴ Crosley pulled workers off their radio production lines to try and meet the high demand. Their patent lasted until 1953, meaning that no other manufacturer could put shelves inside the exterior refrigerator door until then. While some tried to match the appeal of the Shelvador and circumvent the patent (one company added a second internal shelf-laden door, for example), they failed.⁵ An advert in *Popular Mechanics* magazine the following year made plain the impact that the Shelvador as the ‘talk of the country’ had. Nothing, it said, had ‘enthused’ the housewife as much as the Shelvador, which had increased the “usable” space of Crosley refrigerators about 50%’ over same-sized refrigerators without the patented door.⁶ ‘My bottles go behind the door,’ another advertisement mother-in-law told an evidently surprised new bride, who recounted: ‘I followed her to the kitchen and she opened the refrigerator. THERE was the door she meant – holding ten chilled bottles and loads of other things . . . Amazing!’⁷

Imagination and a general optimism about the future of refrigerator sales from the 1930s ensured that a constant stream of new and improved refrigerator features were added to its internal landscape, in an attempt to encourage consumers to upgrade and replace their machines from time to time. Not all of these new features were evidently found to be as useful as door shelving, however, and many didn’t stand the test of time. The utility of some features was not immediately obvious to potential purchasers. Designed features could be out of kilter with the declared needs of the consumer, and novel features were sometimes therefore hard to sell. Frigidaire models from the 1950s featured an integral ‘Ice Ejector’ to automatically remove ice cubes from trays – ‘a shower of ice in half a trice’ – while a 1960 Philco model was hyped as being the world’s first combined fridge freezer in which the freezer compartment could be converted to extra refrigerator space and back again at the ‘Flick of a Switch’.⁸ Neither of these features stood the test of time well enough to become standard. Similarly a 1930s refrigerator featured a door handle that, according to an enthusiastic showman, ‘moves three ways’ so that the customer could open it with their arms full. The advantages of this evidently weren’t obvious to the nonplussed female customer.⁹

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Or perhaps she already had a refrigerator fitted with a foot pedal? Many Monitor Top refrigerators were fitted with foot pedals, which in theory sounded like a very good idea. However, when the door popped open it hit your knee, earning it the painful moniker ‘knee buster’.¹⁰ Some added features were evidently more trouble than they were worth. Ingenious Lazy Susan-style revolving shelves (remembered overwhelmingly fondly by ex-users and still described as a ‘killer app’ by aficionados today) appeared briefly in 1940s American General Electric refrigerators. These were an attempt to make the contents of refrigerators more accessible – perhaps as part of a move to find attractive alternatives to the still patented Shelvador shelves. Their 1948 advert boasted that with a simple ‘twist of the wrist’, you could ‘put all foods at your fingertips’.¹¹ One of the reasons this useful feature



This model has plenty of internal storage. Features are clearly marked as ‘CRISPER’ and ‘DAIRY PRODUCE’.

REFRIGERATOR



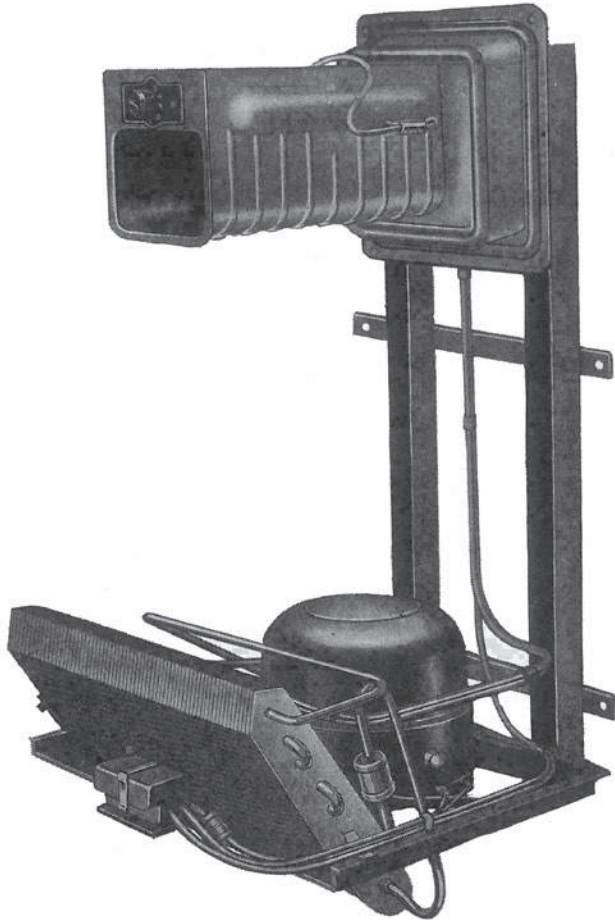
Cream-coloured Kelvinator jug made from urea-formaldehyde and decorated with Kelvinator's trademark helmeted head.

did not survive the test of time is that children were apparently prone to spinning the revolving shelves round so fast that bottles and jars span off.¹²

Refrigerator features in the past were sometimes given special names, stamping the manufacturer's mark firmly onto their machines. Shelvador refrigerators had a 'Shelvabin' to hold more food inside the main compartment while Prestcold refrigerators featured 'Prestalock' doors. Today's fridges are still being designed with any number of special features – from crisper drawers, doors within doors (minimizing the opening of the main fridge door), to water, drinks and crushed ice dispensers, reflecting the same fondness for kitchen gadgets our Victorian ancestors had, and we have today, many of which remain(ed) largely unused.

One that has not appeared in domestic refrigerators is a viewing window. Why? In part it is because nothing much is happening inside. In fact, nothing is precisely what is meant to be happening inside it – the food is meant to be in a state of very slowed-down deterioration, so why would anyone want to see it? Pragmatically it is also the case that having a window cut into the solid door structure potentially reduces energy efficiency and would increase the internal temperature, and because light

can speed up the deterioration of food. Perhaps it is also because the view inside a disorganized refrigerator is not aesthetically appealing. Some of those currently moulding dreams of future refrigerators are designing refrigerators with perhaps the best of both worlds – opaque ‘magic glass’ and liquid crystal glass windows on the front of the machine that become transparent when touched.¹³ In the meantime the reality of living without a fridge ‘window’ is sometimes more comedic. A recent South African TV advert for the government shows a man studying a map of fridge food contents on his refrigerator door. He practices a set of dancelike moves intending to grab ingredients from the fridge at top speed and save energy. His less than conscientious son thwarts his efforts by opening the fridge door and loitering while he decides what to eat.¹⁴



Single piece Prestcold motor and compressor cooling unit from the 1950s. The only part of the machine visible to the user is the small freezer compartment at the top.

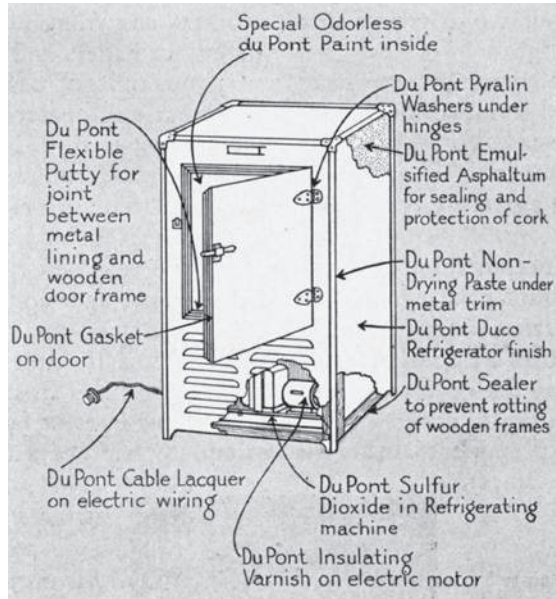
Today's refrigerators, like most other appliances, also hide their mechanical innards.¹⁵ Motor and refrigerating coils – the mechanical heart and pipework arteries of the refrigerator – are usually hidden away at the back of today's domestic machines. The result is that the consumer sees only a small part of the machinery – sometimes the icebox compartment or unobtrusive portions of cooling pipes – and focuses firmly on its carcass finish and its added features. It makes marketing and user sense, however, to hide away the inner workings of a domestic refrigerator, especially given that the outward appearance of early powered refrigerators was based on their icebox predecessors, which of course had no bulky motor-driven heart. They needed to look familiar to the consumer.¹⁶

Looking at the evolution of domestic refrigerators over the past hundred years it is striking that it is also a story of materials and a journey of changing feel, taste, sound and smell for the consumer. Early refrigerator adverts often highlighted the material the machine's outer shell was made from: commonly polished wood in the early years, graduating through to ground-breaking steel – introduced by Frigidaire in 1926. Not long after, the chemical giant DuPont, well known for their paint finishes for cars, spent many months developing an adaptation of their 'Dulux' paint especially for refrigerators.¹⁷ The cool, glossy finish of this hardwearing paint changed the feel of the refrigerator to the touch and reinforced the sense of a clean, hygienic refrigerator finish.¹⁸ A cool 'porcelain enamel' finish also feels more fitting for a refrigerator than the relatively warm feel of a wooden exterior, perhaps. 'Months of gruelling and exhaustive tests' went into its development, with coated metal test panels being bent and struck to see if the finish chipped. It was designed to resist 'chalking, checking, crazing . . . the attacks of edible greases and oils, fruit acids, household gases, humidity, sunlight and mild alkalis such as soaps and washing powders'. Butter and fat were applied daily in a 'grease-and-exposure' test, after which the cleaned panel emerged 'still hard and gleaming white'.¹⁹ By 1936, three million refrigerators had been finished with DuPont 'Dulux'.²⁰

The materials story continues on the inside. While refrigerators used to have enamelled-metal interiors, most nowadays are made from preformed plastic, with a mix of plastic, glass and

ANATOMY OF THE REFRIGERATOR

DuPont developed many other refrigerator materials and features, as this 1929 image from the *DuPont Magazine* reveals.



covered metal shelving. An increasing number of refrigerator tie-in products began to inhabit the fridge from the 1920s onwards. New materials and products – (cellulose) cellophane and later pvc Saran wrap, plastic (polythene/polyethylene) Tupperware containers and Pyrex – all had an impact on the refrigerator interior, changing not only how food was wrapped and stored inside but the taste of foodstuffs stored inside too.²¹ Open a fridge today and you will be met by an almost clinical smell of nothing – the interior usually being made of sterile, almost odourless plastic. Whereas our predecessors usually left their food in glass dishes on open shelves – meat, fish, puddings, salad and jugs of milk all open to the fridge environment and absorbing the smells of other foodstuffs – Tupperware, plastic wrap and Pyrex all protect stored food from absorbing other smells or being tainted, effectively isolating each from one another and from the fridge environment.²² ‘J’achète tous sous Cellophane’, one cartoon housewife declared: ‘visible, bien protégé, intact’ (I buy everything in Cellophane; visible, well protected, intact).²³

Foodstuffs today often come from the shop ready packaged in a bewildering array of bespoke food containers and packaging. Looking through the contents of my fridge the number of foodstuffs purchased pre-wrapped – mainly in plastic – outnumber the unwrapped goods by about three to one. This is typical of a

As appeared in *Woman's Own*

You can Christmas shop for nearly everybody at a Tupperware party.

Even dad and the children.

Clever Tupperware containers make the Christmas season a holiday you can enjoy too! With Tupperware, you can cook ahead and store perfectly. Keep left-overs for meals later on. All fresh and handy in Tupperware. And that's why Tupperware containers make such marvellous gifts for the ladies on your list too.

And now, Tupperware Toys. Educational, hygienic toys your children will love. "Build-a-Fun" . . . a creative construction kit. They have fun building their own, sturdy toys. "Snapics" . . . brightly coloured plastic shapes that press



into their own special mat to make imaginative pictures. And because all things carry the Tupperware name, you know their design and quality are really good. Trust Tupperware to make Christmas shopping fun at a friendly Tupperware Party. To find out more, get in touch with your Tupperware Distributor . . . the number's in the book. Or, write to us for a free copy of "Party Time".
The Tupperware Company, Tupperware House,
11 Upper Grosvenor Street, London, W.1.



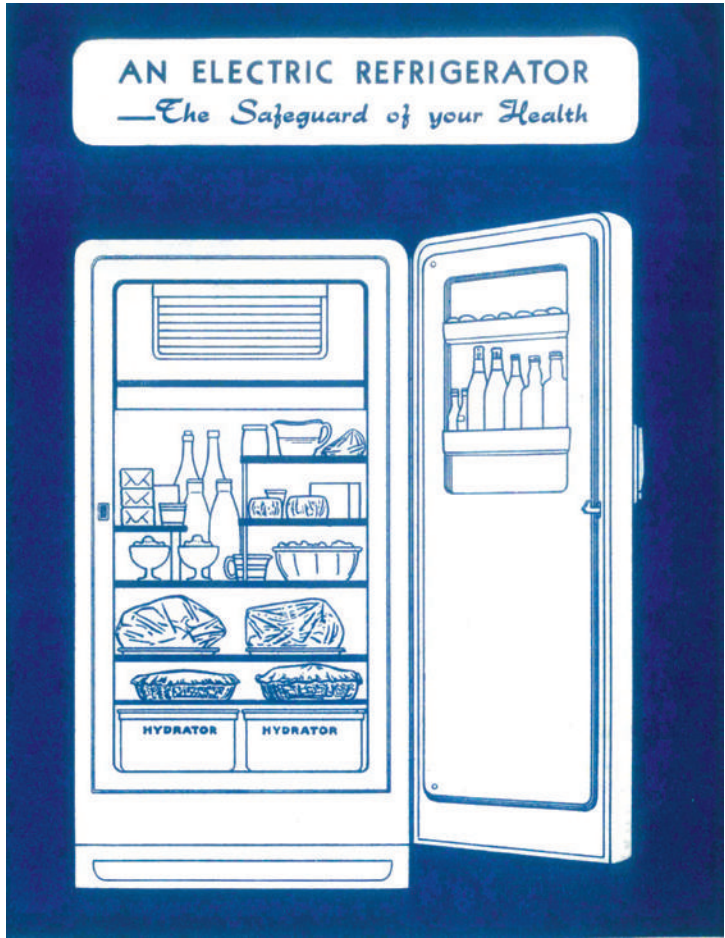
Early 1960s
Tupperware party.

modern refrigerator in the early twenty-first century, where food is often bought wrapped in plastic and sits in the fridge . . . still wrapped in plastic. Apart from isolating foodstuffs from one another within the fridge environment, refrigerators themselves are effectively isolated from their surroundings. The point at which a refrigerator becomes a refrigerator instead of simply a chilled cupboard was marked by the introduction of rubber seals and magnetic door mechanisms. This effectively demarcated it as a self-contained space with its own controllable microclimate.²⁴

What fascinates most people about their refrigerators, however, far more than the smells and other features they have, are the noises they make. Refrigerators have ushered in a range of new noises to the domestic soundscape – some by design, some incidental. Some features deliberately contributed to this new

ANATOMY OF THE REFRIGERATOR

Food arrangement in the refrigerator showing a mixture of open and wrapped food storage, 1950s. Taken from the EDA's *The Art of Cold Cookery* (1960).



domestic soundscape. Crosley's famous Shelvador had an Art Deco-styled radio set available as an optional extra. This could be fitted into the top part of the refrigerator in place of the Crosley emblem. This venture was part of Crosley's brave (or rash) dalliance with more innovative features. While Crosley was more traditionally a communications and a car manufacturing company (they were in fact the biggest radio company in the world by 1924), it was foreseeable that they would try to combine both enterprises within one appliance. Unfortunately, this feature did not stand the test of time. Traditionally domestic appliances combining more than one process have not sold so well in terms of attracting consumers. A later mid-1970s Frigidaire model called the Conversation Piece tried again – with an AM-FM radio, cassette tape player and recorder slotted into the top of the

REFRIGERATOR

IDEAL HOME APRIL 1959

More and more exciting

Gaiety oblong casseroles—Yellow, pink or blue with snowflake or daisy pattern. Deep 25s., Shallow 21s., With stand 29s., 26s.
Instant coffee jug in clear Pyrex. With warmer stand 27s.
Individual baking set, with serving stand. In gift pack 14s.
Gaiety round casseroles, pecky-white/black snowflakes: 2pt. with serving stand 16s., Without stand 2pt. 10s., 8oz. 4s.
Gaiety gravyboat and stand, snowflakes: black on yellow or white on blue; daisies: white on pink. 12s. complete. In gift pack .

PYREX

JAMES A. JOBLING & CO. LTD. WEAR GLASS WORKS HUNDERLAND
Buy only original Pyrex. Look for the hallmark on every piece. Guaranteed for one year against oven-heat breakage

Pyrex range, suitable for oven, refrigerator and table, as advertised in *Ideal Home* magazine, April 1959.

freezer section, designed so that instead of leaving a note on the fridge, the husband, on coming home and shouting ‘Anybody home?’, checks the in-built cassette player for left messages. It could even be removed and taken to the beach, a spokesman proclaimed.²⁵ Unfortunately, it met the same fate as the Crosley radio, its Conversation Piece soon relegated to the scrapheap of failed refrigerator features.

Some refrigerator noises, although appearing random and inexplicable to the user, have an underlying reason behind them. A friend moving into an open-plan studio flat was immediately struck by just how many varieties of noise the refrigerator made. Ruth Schwartz Cowan’s ground-breaking article on the

technological history of refrigerators, ‘How the Refrigerator Got its Hum’, is well named, the gist of the article being that most of today’s refrigerators have a low-level ‘hum’ for a technological reason. This is because in 1920s America relatively noisy ‘compression’ technology effectively won out over the quiet (motor-free) gas absorption method when General Electric decided to plump for compression technology for their new powered domestic refrigerator.²⁶ Early designers were certainly aware of the auditory downside to their noisy compressor. Read through Alexander Stevenson’s 1923 report and you will be struck by just how preoccupied with noisiness manufacturers were (or, at least, how preoccupied they thought *consumers* were with noise). They judged that 1920s consumers absolutely did not want a noisy refrigerator. Particularly noisy contemporary refrigerators included those in which the moving parts were out of balance. One of the main reasons cited was that unlike most appliances, such as vacuum cleaners or washing machines, to which people ‘do not object especially’, refrigerators tended to start up in the middle of the night: a time when the ‘slightest noise . . . is very disagreeable. People may get used to this, but there will be a sales resistance until they do.’²⁷ General Electric mitigated against this by submerging the compressor’s moving parts within an oil bath, while some others chose to mount the compressor on a suspension system, mounted the compressor away from the refrigerator itself or plumped for a moving-part-free gas absorption system.²⁸

Despite being, like General Electric’s machine, hermetically sealed and with new quieter compressors, today’s refrigerators are on the whole still relatively noisy beasts. Consumers’ preoccupation with their noisiness remains. One German manufacturer – Liebherr – markets its refrigerators as making only a ‘whisper quiet’ 36 decibels of noise due to a vibration-free compressor. It would be interesting to know how loud those first early twentieth-century electric refrigerators were. My studio-flat friend is far from alone in finding refrigerator noise intriguing: an Internet search for ‘noisy refrigerator’ brings back over 45 million results. An AEG manual from recent years drew a fascinated following on Twitter, coming as it did complete with a long list of the various normal noises the fridge freezer might make and what they might sound like. The machine might, as the manuals’ illustrations told them, ‘click’ like flicking a light

switch; the motor 'brrr' like a cat; its coiled pipes 'blubb' like pouring a glass of wine and 'hiss' like an electric iron turning on; some unspecified part of its interior might 'crack' like breaking a cracker biscuit and the fan 'ssrrr' like a fly. The guide is the ultimate aural celebration of the refrigerator's hidden inner workings, here visually displayed in a more universal language of pictograms and onomatopoeia. Another recent manual was equally eloquent and forthcoming in describing and translating the particular noises that particular fridge may make, listing 'chirping/barking/woof/howl', 'gurgling', 'knocking', 'hissing', 'sizzling' and 'arching' among the almost twenty distinctive noises that might be heard.²⁹ Unusually dissected and analysed here, nevertheless the refrigerator's familiar hum and (less familiar) 'hiss' and 'crack' have become, for many of us, part of the background sound of our domestic lives. They can blend into a noisy urban soundscape of aeroplane flight paths, the calls of urban foxes and the noisiness of apartment block living. Translocate the machine to a peaceful location or the dead of night and the sounds amplify, both the regular hum and the irregular, unexpected and unexplained 'cracks' competing with the inordinate loudness of your nocturnal heartbeat. That research is being conducted into the reasons behind the refrigerator's 'crack' is indicative of the fact that even the most familiar and mundane of machines has mysterious behaviours and hidden depths if you take the time to peer beneath the surface.³⁰

6 A CULINARY REVOLUTION

Like many, my father had a larder running off the back of the small galley kitchen of his 1920s semi. There was no room, and not expected to be any room, for a newfangled refrigerator. Also like many, when he bought a refrigerator it went into the larder space.¹ Modern, centrally-heated houses do not have a north-facing ‘cold spot’ – a.k.a. larder – in which to store and prolong the life of foodstuffs. New build flats, for example, often have open-plan combined living and kitchen spaces, or compact smaller dedicated kitchens with a built-in fridge or fridge freezer. Modern interiors seriously limit options when it comes to storing food. The inevitable solution is to store more in the refrigerator, to the point at which many of us have forgotten what is appropriate or inappropriate to store inside.

Refrigerators have without doubt been revolutionary players in our lives. Over the past 150 years, the ability to transport, sell and store foodstuffs at home at a consistent low temperature throughout a refrigerated food chain has altered shopping, diet and cooking habits beyond all recognition. Both liberating and constraining, refrigerators have undeniably changed food habits and diet more than any other kitchen appliance. Refrigerators have brought an unparalleled capability to ignore and override the sense of seasonality of produce. They have distanced many of us, both literally and metaphorically, not only from the means of (food) production but from the roots of the produce itself: we are increasingly divorced from the processes and rhythms of food growing, harvesting and processing. Refrigerators are tools





Oranges being loaded onto a refrigerator car at a packing plant in California, 1943.

The first cargo of bananas after the Second World War arrives to crowds at Avonmouth docks, Bristol, in 1945, making the front-page news.

Birds Eye frozen products being uploaded onto a British Rail container, mid-20th century. 'QUICK FROZEN FOOD', 'not to be opened until arrival', a notice reminds you.

of food storage, preparation and consumption, serving to replace time-honoured seasonal producer habits with year-round gathering and consuming habits and the annual rhythms of harvesting with the daily and increasingly weekly rhythms of shopping and storing in the fridge.² The suburbanization of early twentieth-century America was only made possible by the widespread introduction of refrigerators and cars, enabling a symbiotic gathering and consuming relationship to flourish between the two machines.³ Refrigeration and refrigerators have in effect changed whole landscapes – making possible previously unimaginable and unsustainable cities like desert-bound Las Vegas, situated far away from natural river transport links and natural water and food resources.

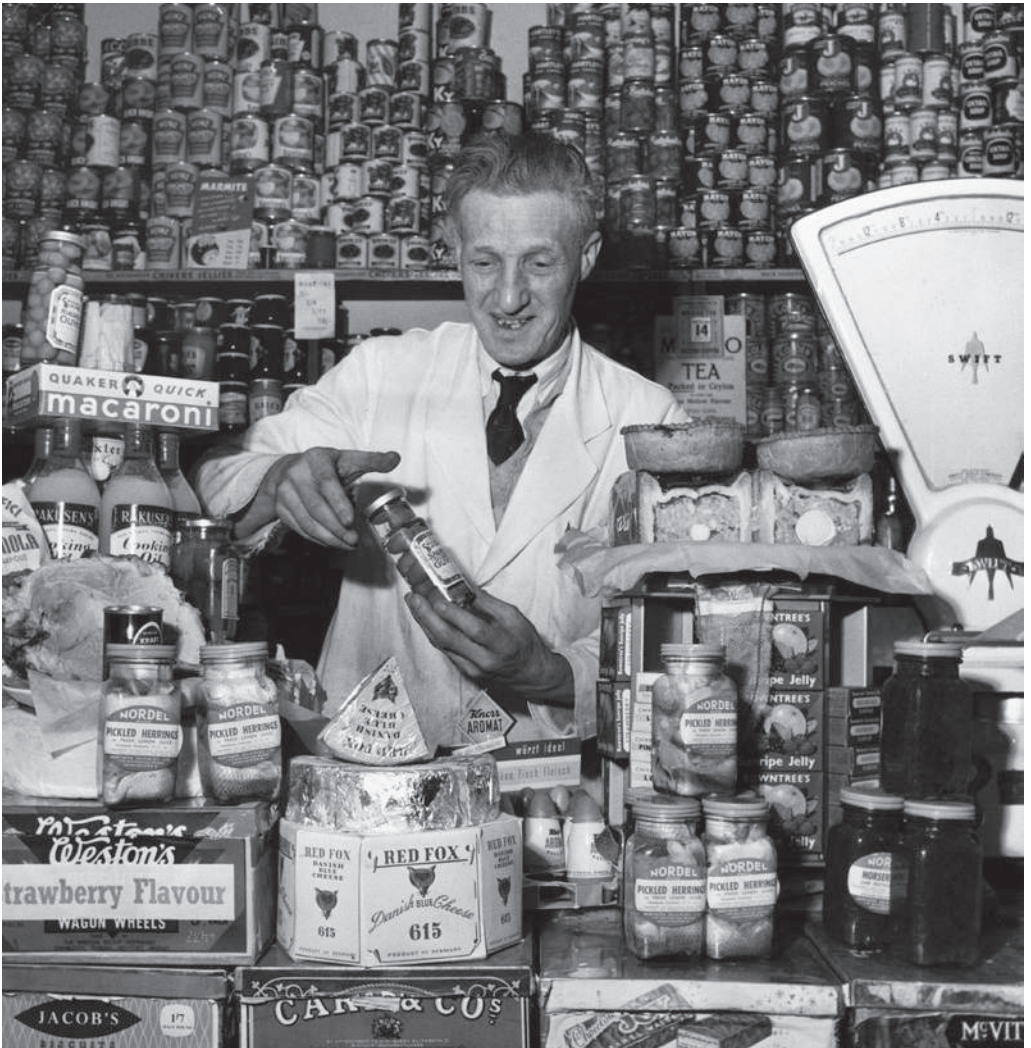
Refrigerators have also brought more food choice. Today we are increasingly familiar with a bewildering array of widely sourced foodstuffs – the variety and exotic origins of which would have confounded our ancestors. Bananas, for example, virtually unknown in Europe before the twentieth century, began to arrive in large numbers on banana boats fitted with refrigerated

plants in 1901 when the Fyffes Company began shipping them to the UK and to Norway in 1905.⁴ By the mid-twentieth century in Britain it was possible to buy frozen strawberries, raspberries, peas and all sorts of 'out of season fruits and vegetables in the most perfect condition even in mid-winter'.⁵ Twentieth-century refrigerators increasingly became repositories for an out-of-season collection of the 'fruits of this earth' and a showcase for 'nature's bounty'.⁶

Refrigeration is, as the author Jonathan Rees points out, the only food preservation process that does not change the taste of food.⁷ While some refrigerated foodstuffs were newly available, the spread of the refrigerator also made virtual relics of other popular foodstuffs preserved in alternative ways. While it is common to keep smoked fish, pickles and cheddar in the refrigerator, it certainly isn't necessary. Many familiar foodstuffs – bacon, cheddar cheese, smoked kippers, raisins and jam and chutney preserves – may never have been introduced if refrigeration had been invented sooner.⁸ The growing popularity of refrigerators also brought the invention of particular refrigerator foodstuffs – from individual yoghurt pots ('Ski' first of all in the 1960s) to chilled TV dinners. Frozen foods followed. The first frozen food available in Britain was asparagus, shortly followed by the more popular fish fingers, other frozen fruit and vegetables and, of course, ice cream. The first fish fingers went on sale in 1955, produced by Birds Eye in Great Yarmouth, and originally patented in the United Kingdom by Clarence Birdseye in 1927. They were initially going to be called 'battered Cod Pieces' before a vote by workers chose 'fish fingers' as the better name. For the late 1970s housewife, these foods became shopping list favourites due to an emerging culinary trinity of supermarket, fridge freezer and microwave, which enabled career women (and men) to juggle home and work responsibilities. Magazines and advertisements also encouraged the housewife to preserve gluts of fruit and vegetables to prevent having a bare larder or any food wastage: 'Freeze it when it's plentiful. Eat it when it's scarce' advised the Electricity Council, allowing you to have 'Raspberries in December' and 'Pheasant in June'.⁹ Bejams, Sainsbury's and Iceland freezer centres gradually became household names in Britain, supplementing a growing number of shops and supermarkets with refrigerated displays and counters. For Sainsbury's

this supplanted the use of ‘ice usually delivered by Italian carmen’ to cool shop basement areas – the use of which was still within the memory of many of their workers in the 1960s.¹⁰ Even in 1957 the average British housewife was making an estimated 3.3 trips to the butchers and 7.6 to the grocers each week.¹¹ Smaller local butchers also found themselves increasingly busy in the post-war and post-rationing boom period. Bob Dixon remembers his family-run butcher’s shops in the Bournemouth area, which prospered in the 1950s. They ‘splashed out’ on a new shop front for their Canford Cliffs shop. They also ‘obviously’ had refrigeration – in the form of ‘a big fridge out in the yard’.¹²

Grocer Peter Hevicon from Manchester photographed in 1957 surrounded by the mainly canned, pickled and tinned produce he sold.



Frozen food and refrigerator manufacturers worked together to promote each other's products. For example Birds Eye persuaded Prestcold (and Frigidaire) to design display cabinets for their food products. In return they promised to supply only the shops that installed their refrigerator cabinets.¹³ Not everyone was convinced, however. Some treated 'newfangled' foods with suspicion or overt dislike. 'I'm too old for these modern ideas,' one 64-year-old told Mass Observation about frozen food in 1953.¹⁴ Mrs Owen, interviewed sometime later, said that she didn't like many of these new foods: 'My daughter cooks all sorts of horrible stuff. I don't like . . . curries or pizzas. No. Yoghurts and that kind of thing.' The interviewer commented on the 'venom' with which she said 'yoghurt'.¹⁵ Metal shopping list aide-memoires (which were used by householders in the mid-twentieth century to list for the delivering grocer what foodstuffs they wanted to order) reveal just how few of the groceries ordered from the grocer by many a housewife in the early twentieth century were fresh ones requiring an icebox or refrigerator to store them in. The list of staples includes cheese, lard, tapioca, blancmange powder and raisins. These foodstuffs were also stored in a wide variety of places – especially where homes had no refrigerator. A 1943 survey of homes highlighted a family cottage in which plates of meat and pies were stored in a meat safe on the outside of the kitchen; jugs of milk and lettuce on the windowsill; bread and cheese and so on on the dresser; bottles of preserved fruit and conserves in the dresser cupboard; the cat's dinner and some staples on a chest; and condiments, including pickles and pepper, on a shelf by the stove.¹⁶

This presents a stark contrast to the average shopping basket in the twenty-first century. The Office for National Statistics' shopping basket of purchased products for 2015 includes a long and varied selection of meats, fish and dairy products and frozen goods and ready meals that it would have been far trickier to store in the home sixty years before. The growth of supermarkets and the emergence of the weekly instead of daily shop certainly made lives easier. Lesley Garner, featured in *Good Housekeeping* magazine in 1979 trying to follow a routine originally suggested for a 1947 *Good Housekeeping* housewife, found it particularly trying. How, she wondered, was the housewife meant to spend each afternoon 'attending to child, shopping, mending,

gardening, etc.’ all at the same time, as suggested for the 1940s housewife?¹⁷ Today, the ‘death of the weekly supermarket shop’ is being widely reported.¹⁸ More people are turning towards a pattern of one large shop every few weeks and more trips, more often, to a wider variety of stores. This change has been driven by several factors, including the growth of online shopping as well as a growing trend for cooking from scratch again and a degree of bargain hunting as people shop around, as well as a general sense that we have fallen out of love with the big shop.

The natural human gathering and hoarding tendency which refrigerators aggravate has its problems, because despite their preserving attributes our use of and attitude towards them generates waste.¹⁹ If you are rich enough you can plan meals around a quick trip to the shop rather than what needs using up at home. ‘Waste not, want not,’ a phrase familiar to our ancestors, can now be thrown out of the window. Why is there a glut of food there at all? It’s not as simple as being unable to spy forgotten foodstuffs hidden away out of sight on the top shelf of the refrigerator, unused and decaying shamefully away. The hoarding tendency is also driven by an image and perception of what refrigerators ought to contain, together with wider societal suggestions as to what we should be eating. As the food writer Rose Prince acknowledges: ‘I suffer from a condition I call aspirational greed. I buy things not because we need them but because I think we as a family should be eating them.’²⁰

The social and cultural meanings attached to the food content of a refrigerator, then, can convey as much guilt as well as cachet as the type of refrigerator itself. A recent report suggests that while there are basic foodstuffs that all consumers buy, as social status changes refrigerator use changes too. A fridge tells you about people’s ‘beliefs and aspirations’, according to Tassos Stassopoulos, who analyses refrigerator contents the world over.²¹ The typical contents of someone’s first fridge tend to be recipe ingredients and leftovers to ease the workload, while as people become more middle class in any country or culture, they begin to purchase indulgence goods, including flavoured milk, conserves and so on. The fridge of someone wealthy tends to contain a greater proportion of health foods.²² Geographical variations in fridge contents reflect local customs and beliefs. In São Paulo, Brazil, refrigerators tend to contain a lot of branded products,

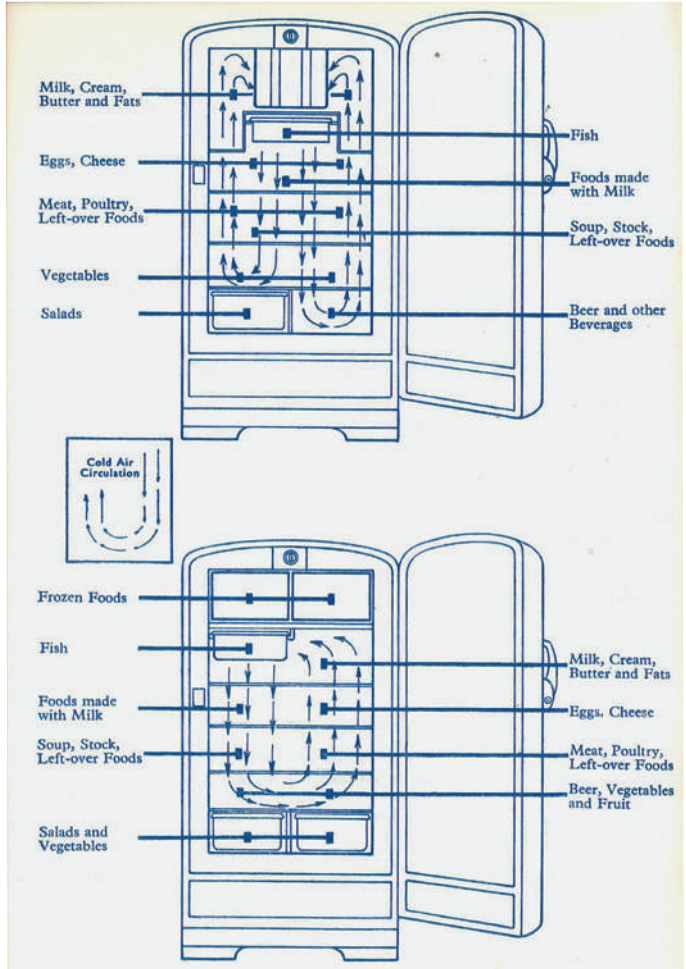
while Nairobi teacher Fiona Tomlinson was enjoying the new luxury of the varied diet owning a refrigerator had given her compared to life on her family farm, where, without electricity, you ate what was available at the time.²³ A North Indian householder dreamed of owning a refrigerator: her current daily routine involved three trips to the market so she could cook meals ‘just in time’. Owning a fridge would enable her to produce meals in advance and make a difference to their family income.²⁴ Such cultural variations in fridge habits are not a new phenomenon. Watch a classic 1930s *Tom and Jerry* cartoon and you will catch glimpses of the well-off owner’s refrigerator’s innards, resplendent with elaborate jellies and desserts alongside the ubiquitous lump of cheese for Jerry.

As we become dedicated food *consumers* it is all too easy perhaps to lose touch with the common sense or tacit food knowledge held by many of our predecessors. The once-familiar bottling, salting and drying techniques passed down between generations become less familiar. Even inherited food knowledge was at one time new. It originates from somewhere: acquired from watching others bottle and pickle or test for freshness by smell and sharing expertise and knowledge.²⁵ It is not always obvious as to whether or when food should be stored in a refrigerator: everyday practice, scientific study and common sense can provide a wide variety of answers. Google ‘should eggs be stored in the refrigerator?’ for a good example of this. We often rely on the best-before dates on packaging rather than touch, sight, smell and taste to tell us when to throw food away.

Early refrigerator users commonly failed to use their machines in a way deemed proper by manufacturers, often turning them off at night and during the colder months, or forgetting to close the door. This sort of (mis)use was evidently particularly concerning for early refrigerator manufacturers. Flick through an early refrigerator cookbook or manual and you will inevitably find diagrams showing you how and where to place various foods within the refrigerator and instructions explaining the discipline of preparing and wrapping foods for refrigerator storage. Despite their familiarity to us today, we are perhaps not always as au fait with their use as we think we are. How many of us consider how we organize the contents of our fridge or read its operating manual from cover to cover?²⁶

Educational diagram from *The Art of Cold Cookery* (1960) showing the flow of cold air around the refrigerator and the best placement of foodstuffs within.

Photograph by Ann Rosener showing the organization of an American refrigerator during the Second World War, with meat and milk stored nearest the freezer compartment.



REFRIGERATOR

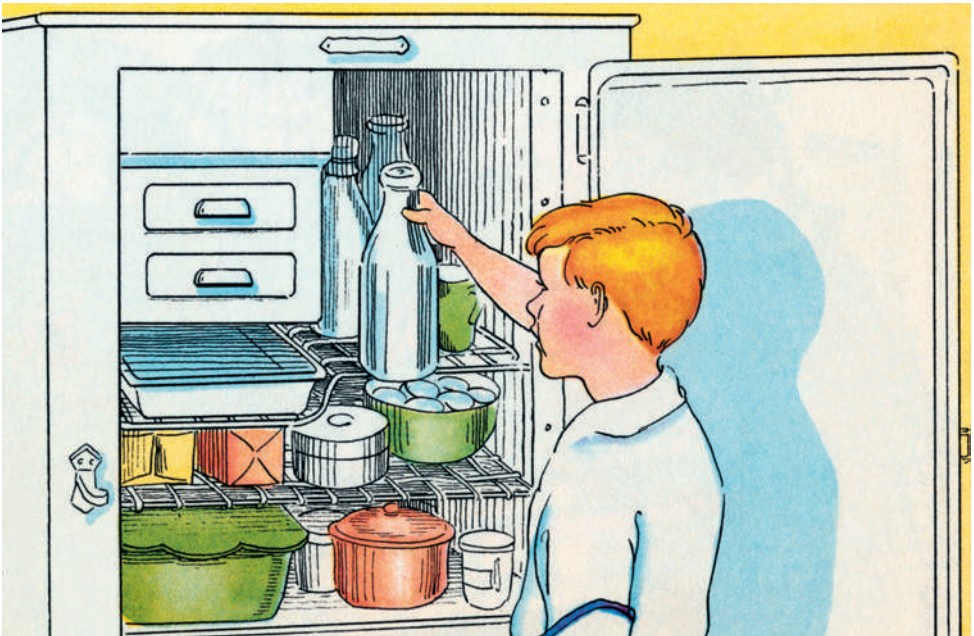
The rhetoric of cookbooks and manuals and the sales patter of early refrigerator salesmen and demonstrators emphasized their potential to save money by reducing food waste and saving leftovers. These two extracts from 1960 and 1937 are typical:

You will find your Prestcold is of infinite value. After a little time, you will wonder how you managed without it. Day in, day out, summer or winter, it keeps food fresh . . . wastage of food is eliminated. You can buy in larger and more economical quantities without fear of the food deteriorating.²⁷

No up-to-date kitchen is complete without an electric refrigerator . . . all food and drinks that *should* be served cold *will* be served cold, even in the hottest weather – iced beer or wine, firm butter, crisp vegetables, fruit firm and fresh, ice and ice-cream whenever required.²⁸

Who is the ‘you’ mentioned? The target ‘you’ was the housewife. Manual and cookbook illustrations showed women, appearing as whole figures or disembodied hands. Depicted as mothers, they give treats or healthy milk to children or instruct their daughters in refrigerator use; as cook-generals and maids,

Boy taking milk from a refrigerator, 1938. Contemporary refrigerator manuals featuring male users are fairly uncommon.



A CULINARY REVOLUTION

Photograph from 1930 entitled 'Surprised', of a boy taking food from the refrigerator.



they serve prepared dishes to guests; and as hostesses, they oversee meal and party preparations. Women, then, were usually the gatekeepers to food in the home. In the case of early fridge models, women usually literally held the key to the fridge door. But while refrigerator manufacturers evidently expected women to be the main users early on, the increasing amount of convenience food purchased has opened up and democratized their use, freeing up other household members to raid the fridge. This is a development which, although associated with 'modern' living, was predicted as early as 1912. As larger family-sized refrigerators became increasingly common in the late twentieth century, the uptake in convenience foods and TV dinners has meant that for many there is no longer a sit-down shared dinnertime. Instead mealtimes are often fragmented and the day punctuated with grabbed meals and snacks. Part of the rite of passage of student life is bagging shelf space in the communal fridge. The upturn in obesity rates in the second half of the twentieth century has been linked by historian Lizzie Collingham to the end of rationing after the Second World War.²⁹ Many post-war baby boomers found controlling their food intake once rationing ended challenging after the years spent craving meat, carbohydrates, butter and sugar. Others have more

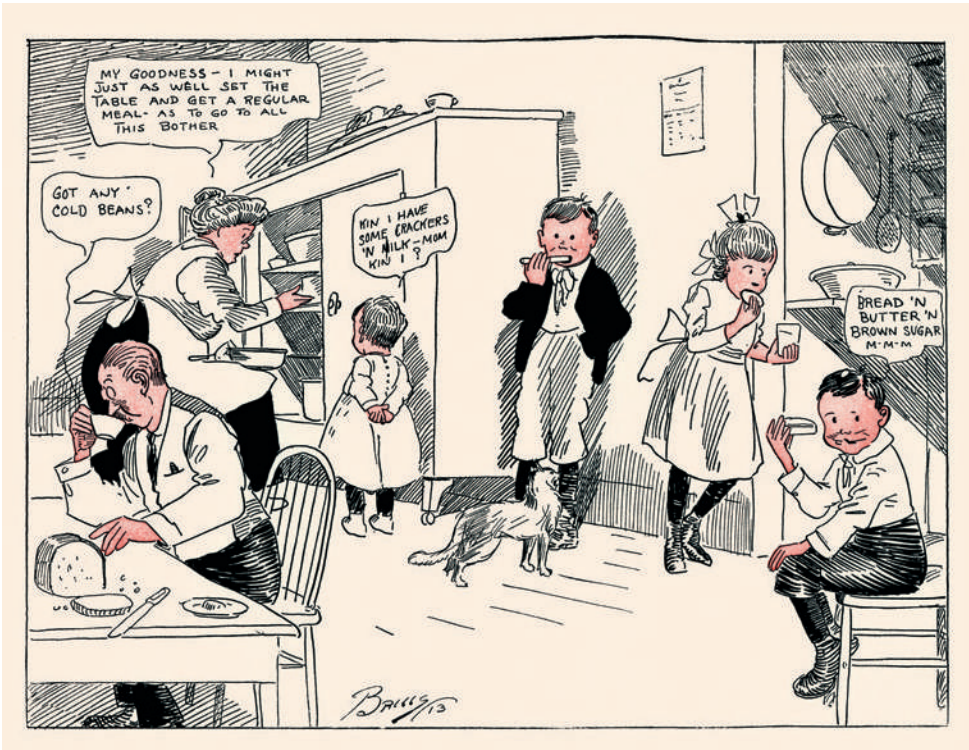


The
ART



of
COLD
COOKERY

PRICE: THREE SHILLINGS



'Sunday Evening 1912'. A cartoon of a family eating a snack of milk, bread and crackers; early refrigerator culture perhaps, and a sign of things to come.

Front cover of *The Art of Cold Cookery* (1960), showing the optimum placement of different foodstuffs inside. Evidently popular, this book was reprinted nine times between 1937 and 1960.

controversially suggested that large fridges appeal to a generation of babies bottle-fed to a time schedule rather than fed on demand when they were hungry. Fridge use and food habits make for complicated human psychology!

Refrigerator cookbooks up to the 1960s in particular sought to combine the science and technology of refrigeration (touting their food and health safeguarding credentials) with the more *creative* elements of *creating* meals.³⁰ Early refrigerators, like iceboxes, tended to be mainly used for storing ingredients rather than finished dishes. Refrigerator manufacturers found it necessary to counter the widespread view that a refrigerator would only be 'used for bottled milk and butter and perhaps the week-end joint' rather than the 'hundred and one things' you could store in it.³¹ Even in the London of the 1950s some questioned what on earth they were going to fill their refrigerators with. Bethnal Green resident and social observer Phyllis Wilmott questioned if the machine had any future at all in the home. Although refrigerators were a sign of success, she wondered: 'what will the mothers do with them? If families were still



G Brand powdered milk manufactured for Bethnal Green Borough Council, mid-20th century. The packet contains the equivalent of seven pints of milk when made up. Dried milk was important where households did not own a refrigerator.

as large as they used to be, the “fridge” would be full, no doubt, with each day’s shopping. But with today’s smaller families will the fridge stay half-empty, or will the wife stay away from the shops?³² At a time when foodstuffs such as dried pulses and milk were still staple foods, she was right to doubt the refrigerator’s staying power.

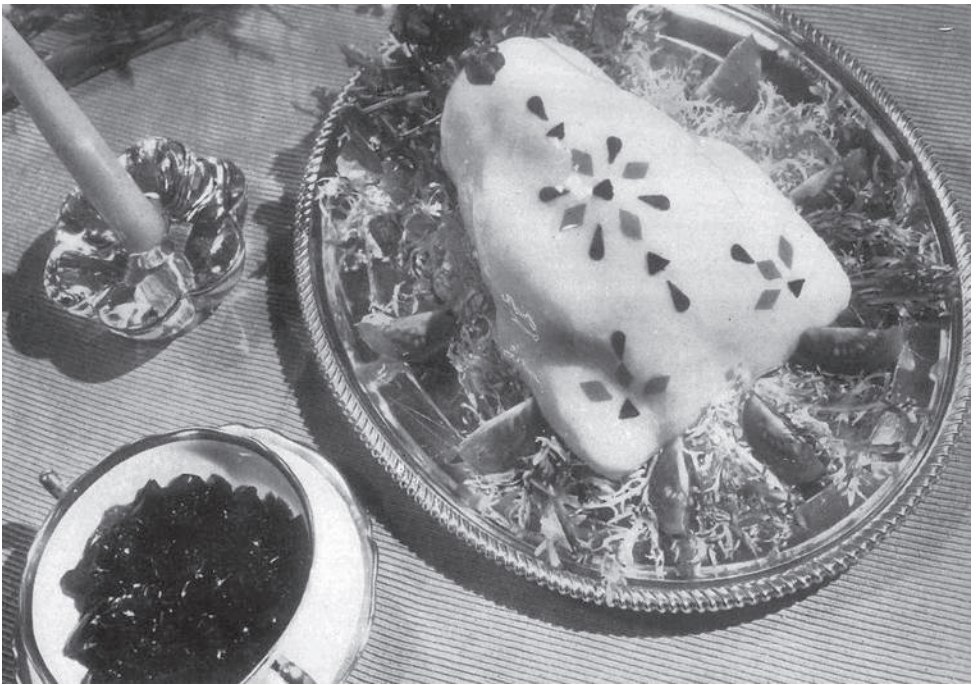
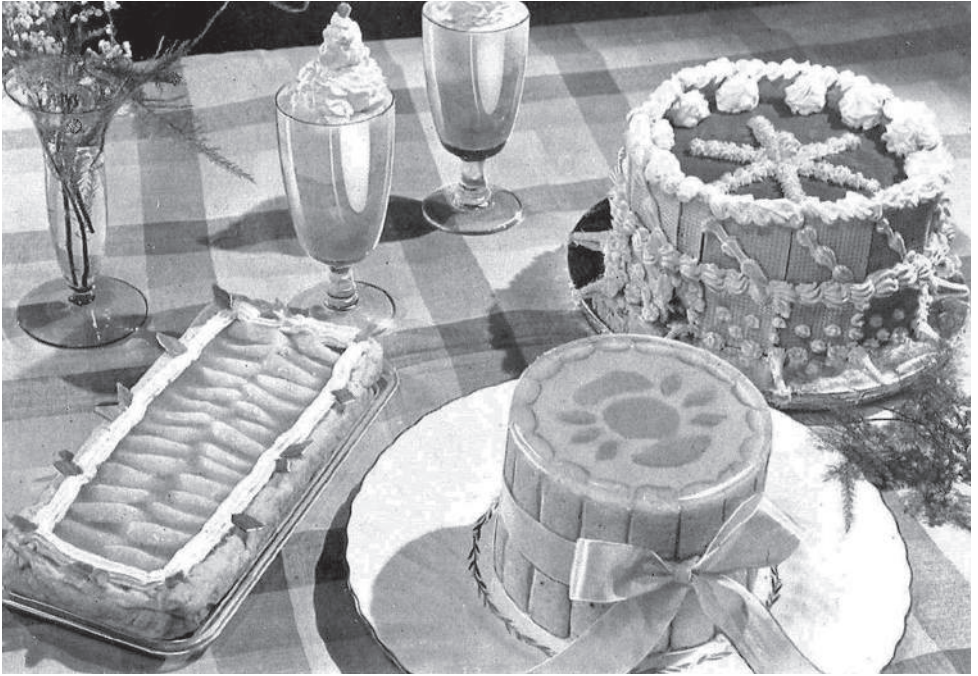
Refrigerator manufacturers went much further in their sales ambitions than encouraging their use for ingredients, ushering in a whole new culinary concept – ‘cold cookery’ – for refrigerator recipes. This was about encouraging a whole new culture of cold cuisine, using the refrigerator to create both individual dishes and whole dinner party menus. It becomes glaringly apparent that refrigerator manufacturers explicitly adopted these terms in the 1930s during those very early years of domestic machine use.³³ Although the term is used earlier (notably in Auguste Escoffier’s *A Guide to Modern Cookery* from 1903),³⁴ refrigerator manufacturers and vested interest groups appropriated the phrase and used it in a systematic way to delineate it as a particular benefit of refrigerator ownership in order to heighten their appeal and status. In the 1930s very popular cold cookery refrigerator manufacturer Norge ran demonstrations. One particular week saw more than a hundred participants descending on local dealers the Kickliter brothers, according to the American newspaper

the *Sarasota Herald Tribune*. Mrs Carrie Reid created the winning competition recipe of pimento cheese salad, while all contestants were entered into a ‘national cold cookery’ contest. In 1936 the *Courier-Mail* newspaper in Brisbane, Australia, went even further, hailing cold cookery as a ‘new branch of culinary art’ explicitly created as a result of the invention of ‘automatic refrigerators’.³⁵ You could, the paper suggested, create Crabmeat Cocktail, Jellied Tomato Bouillon and Frozen Fruit Salad, among many other sophisticated recipes.³⁶ Australian refrigerator company Charles Hope Ltd, manufacturer of the Charles Hope Cold Flame (kerosene) Refrigerator in the mid-twentieth century, similarly produced a manual-cum-recipe book including all the new cold cookery standard recipes. Parfaits, egg-nogs, fruit cups, jellied meats and salads and ice creams galore all featured heavily.³⁷

Norge, LEC, Prestcold, Tricity, English Electric and the (British) Electrical Development Association all published cookbooks with ‘cold cookery’ in the title between the 1930s and 1960s, while AEG’s *Kalte Küche* continued the theme in Germany.³⁸ The very popular *Good Housekeeping* magazine

Mrs Foster at her electric refrigerator, Irwinville Farms, Georgia, 1938, photographed by John Vachon for the Farm Security Administration/ Office of War Information (FSA/OWI) in the USA.



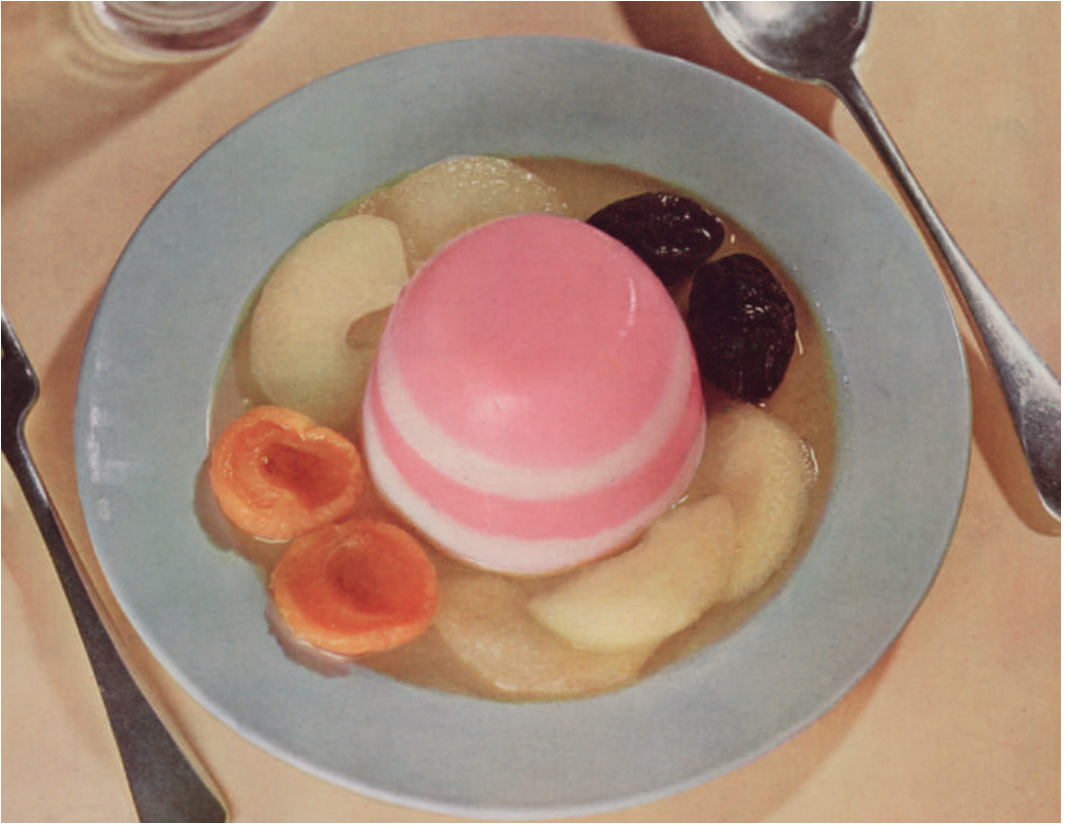


got in on the act, publishing special ‘cold cookery’ editions in conjunction with the Gas Council in the 1950s. The rhetoric of these manuals makes part of their mission very clear. They are selling the use of the domestic refrigerator for cold cookery as an exciting new and novel type of cuisine and one that was *unique* to refrigerators, aiming not just to reflect but to direct contemporary taste and cuisine. This excitement is palpable in Alice Bradley’s 1927 book *Electric Refrigerator Recipes and Menus*, one of the very earliest domestic refrigerator cookbooks.³⁹ For Bradley the refrigerator heralded a completely new and exciting way of cooking: ‘To many people electric refrigeration is still such a novelty that they scarcely realize the range of its possibilities. It is almost like having an Aladdin’s lamp and not knowing the right way to rub it.’⁴⁰

Above all the florid and excitable language of many of these cookbooks makes it plain that they sought to raise the status of refrigerator recipes from that of mere cooking to that of art form and lifestyle choice. Cookbook titles include *The Art of Cold Cookery* and *Artistry in Cold Food Preparation*.⁴¹ According to the latter, refrigerator ownership ensured that ‘Artistry in the preparation of cold food is now within your reach.’⁴² The sophisticated naming and ingredients of some dishes was meant to signpost their desirability: the higher their status and greater the use of foreign-language words, the more mysterious the dish, ‘with pompous names whose reading generally provides no information’.⁴³ Typical party dishes regularly appearing in these books included elaborate salads and meat dishes preserved in aspic and decorated chilled puddings and desserts – their ‘freshness’ visibly preserved and presented in clear encasing jelly. Molded chicken salad, stuffed tomatoes in aspic, refrigerator cookies and rolls, a seemingly unending variety of ices and sorbets, chilled cocktail starters, drinks and sherbets frequent cookbook pages.⁴⁴ Recipes from these manuals form an increasingly splendid and exotic-sounding list: California Nippy Cheese, Decorated Angel Parfait in Charlotte Russe Cups, Vassar Devils, Beef Galantine, Bronx Cocktail, Orange Pekoe Mousse, Fudge Luxuro Éclair, Malaga Fruit Salad, Hawaiian Delight, Orange Foam, Canton Fruit Cup, Chinese Chow Chow Whip, Crème Delysia, Cutlets in Aspic, Egg Toadstools and Iced Camembert Cheese. All, of course, to be prepared using ingredients stored in the refrigerator,

From left to right:
Apricot and Apple Flan,
Day Dreams, Apricot
Charlotte and Cream
Waffleau – ornate
desserts from *The Art
of Cold Cookery* (1960).

Consommé and
a Chaud-froid of
Chicken – basically a
cooked chicken coated
in chaud-froid sauce and
aspic before being chilled
in the refrigerator. Both
typical examples of highly
decorative food from *The
Art of Cold Cookery* (1960).



prepared using the refrigerator and stored ready for serving in the refrigerator . . .

Cookery books in general were luxury items and out of reach to many,⁴⁵ with refrigerator recipe books usually only issued by the manufacturer when a refrigerator was purchased. In Britain this all changed in 1963 when publisher Paul Hamlyn released the experienced cook and home economist Marguerite Patten's *500 Recipes for Refrigerator Dishes*. Between the 1960s and the 1980s Patten and Hamlyn published over thirty books in the '500 recipes' series.⁴⁶ These books broke the mould – being priced at a fraction of rival luxury cookbooks and kick-starting a mass market for high-quality, lavishly illustrated and affordable cookbooks. *500 Recipes for Refrigerator Dishes* sold for one shilling and sixpence on publication, less than half the price of the EDA's *Art of Cold Cookery* of 1960.⁴⁷ The release of this extremely popular book was a clear sign that refrigerators had become mainstream consumer items.

Impeccable food photography of a contemporary chilled blancmange dessert by leading colour photographer John Hinde, taken from the 1947 book *The Small Canteen: How to Plan and Operate Modern Meal Service*. Hinde was best known for his social history photography and post-war seaside postcards.

The very inside of the front cover has a clear and telling statement of purpose in the form of a bullet-point list:

- Do you make the best use of your refrigerator? . . .
- If you think that your refrigerator is only useful in the warm weather MARGUERITE PATTEN will prove you wrong . . .
- *500 Recipes for Refrigerator Dishes* will give you a completely new slant on every aspect of cold cookery.⁴⁸

Cookbooks and appliance manuals intimately reflect their times, their culture, society and technology, and refrigerator cookbooks and manuals are no exception. They provide a fascinating insight into the hopes, aspirations, social and cultural context of the times.⁴⁹ Patten's 1960s recipes reflected a continued post-war sense of optimism, the better availability of more exotic ingredients made possible by refrigeration and an increasingly multicultural British society. Chilled Summer Chowder, Jamaican Jiggers and Hawaiian Iced Coffee all featured.

What could be more fitting than to end the chapter by recreating some of these early cold cookery refrigerator recipes? The rhetoric of artistry and art, together with names such as Orange Pekoe Mousse, implies something sublime, while the lists of ingredients are sometimes foreign to today's tastes. Food historians like Ivan Day and vintage food blogs such as resurrectedrecipes.com reflect a growing trend for (historic) food recreation and a growing fascination within social sciences research with exploring the senses of taste, smell, touch and so on. Food recreations attempt to bring us closer to the past: using tastes, smells, sounds is a heady way to make the past come alive or to jog someone's recollections of their own past. Even chefs are getting in on the act: Heston Blumenthal's *Historic Heston* (2013) recreated tweaked forms of classic British dishes from the fourteenth century onwards. Between 2013 and 2015 a number of refrigerator recipes were recreated for visitors to the Science Museum's 'Lates' programme of adult events, among others. The ones I recreated were mostly chosen as popular and recurring types of recipes. They reflect various trends in cold cookery: popular dishes, convenience dishes, leftover dishes and fashionable



White Mountain ice cream maker, with wooden bucket and paddle to stir the ice cream mixture.

(if sometimes whimsical) dishes among them. First up were Refrigerator Cookies and Peppermint Candy Cream, both taken from Frigidaire's early classic *Frigidaire Frozen Delights* (1927). These were recipes that were included in the cookbook to show the consumer of the time that the refrigerator could be used to create recipes in an entirely new and convenient way. Refrigerator Cookies use the cooling and preserving properties of the fridge to keep the prepared cookie dough firm and fresh and ready to be conveniently cut and put in the oven when needed. Peppermint Candy Cream showed that ice cream could be made simply and relatively quickly using the (then) novel freezer compartment, avoiding the more laborious use of a dedicated ice cream maker.

Both of these dishes sound relatively contemporary – you can imagine them being served up today. Others such as this cocktail recipe, again taken from *Frigidaire Frozen Delight*, are more unusual:

Raisin Cocktail

Pour some sherry wine flavor over seedless raisins and let stand in Frigidaire for one hour. Make a sauce of one cup tomato catsup,

season with dash of tobasco [sic] sauce, celery seed and the juice of two lemons. Add a few chopped almonds. Fill glasses and chill.

Ingredients like celery seed are seemingly old-fashioned and are used less than they used to be. And why sherry wine flavour? Check the recipe's date and it all makes sense. This is a recipe written for America's Prohibition era, designed to be made by an abstemious law-abiding party host, perhaps. How did it taste? Tasted when freshly made, it was a bit raw. Left as instructed in the refrigerator to chill and it tasted like a palatable, fruity Bloody Mary, with slightly less of a kick than today's versions.

Another popular recipe, Moulded Cereal, was included in cookbooks to show off the refrigerator's vaunted ability to save leftovers. The porridge served up for breakfast could be saved, pressed into elaborate jelly moulds to be set and re-served completely transformed for tea with the poached prunes, apricots or canned peaches and berries typical of the times. Alternatively it could be sliced and fried. Given the gelatinous texture and lack of flavour of the cereal to my modern taste buds, it's perhaps no surprise that many recipe books proposed such cold cereal dishes as being particularly suitable for children's meals.⁵⁰



This freezer tray would have been used to freeze ice cream and other iced desserts. Science Museum visitors tested out a recipe for Peppermint Candy Cream taken from *Frigidaire Frozen Delights* (1927) around the corner from this contemporaneous refrigerator.

Salads

CLIFTON SALAD

1 lb. chopped apples. 2 tomatoes. Juice of 1/2 lemon.
1 lb. chopped celery. 1 lettuce. 1 pt. mayonnaise.
1 lb. chopped walnuts. Salt and pepper.
Mix lemon juice with chopped apple. Add celery, walnuts, salt and pepper and mayonnaise. Toss thoroughly. Arrange lettuce leaves round the salad bowl—chop remainder and place in centre with the mixture piled on top. Decorate with slices of skinned tomatoes.

COTSWOLD SALAD

Tomatoes. Toast. Cottage cheese.
Cucumber. Onions.
Place a slice of toasted bread in the bottom of a salad bowl. Over it put a layer of sliced and peeled tomatoes, then a layer of sliced cucumber. Sprinkle with salt and pepper and finely-chopped onions. Continue this arrangement until bowl is filled. Pour over all a blend of 2 tablespoons each of vinegar, oil and tomato juice. Top with a mound of cottage cheese.

COTTAGE CHEESE APRICOT SALAD

1 packet lemon jelly. 1 pt. double cream.
1/2 pt. boiling water. 1/2 cup coarsely chopped walnuts.
1/2 pt. apricot juice. 1 cup chopped maraschino cherries.
12 oz. carton cottage cheese. 1 cup sliced tinned apricots.
Dissolve gelatine in boiling water. Add apricot juice and mix well. Chill until of a jelly-like consistency. Fold in cottage cheese, whipped cream, walnuts, cherries and apricots. Pour into a lightly oiled 1 1/2 quart mould and chill until set. Garnish with apricot slices if desired. (Serves 6).

EGG TOADSTOOLS

4 hard-boiled eggs. 1 oz. butter. 1 bunch of watercress.
Anchovy or other sauces. 2 tomatoes. Seasoning.
or grated cheese. 1 tablesp. mayonnaise.
Cut tomatoes in half, remove centre and seeds. Cut a thin slice off the broad end of the eggs. Scoop out the yolk, and mix it with the chosen flavouring—butter and seasoning—sieve the tomato pulp, and add to the mixture. Fill the eggs with this, and stand them (the cut end down) on a bed of shredded watercress. Put the half tomatoes stuffed with the remainder of the mixture on top of the eggs and put little dots of mayonnaise on the tomatoes. Serve mayonnaise or French dressing as required.

NUT AND RAISIN SALAD

Lettuce. Seasoning. Tomato peeled and sliced.
Mint (chopped). Salt and dressing. Finely chopped spring onion or chives.
Parsley (chopped). Raisins. and sprinkle with lemon juice.
Arrange some shredded lettuce, mint, salt and pepper. Add raisins and other ingredients separately. Decorate with the nuts, raisins, etc.



Prestcold Catering's
'Egg Toadstools' from 1959.
Original cookbook in the
background and my version
in the foreground.

The last recipe tested, Egg Toadstools from Prestcold's 1959 booklet *Prestcold Catering*, is perhaps the truest to the aims of the new cold cookery, which at its peak was looking to showcase novel ways of presenting dishes. For 'Egg Toadstools', eggs, tomatoes, dots of mayonnaise and a green bed of watercress masquerade as toadstools. Contemporary commentators reflected on a degree of falseness and lack of authenticity in foodstuffs and concoctions creeping into recipes in the mid-twentieth century. This is echoed in many of the recipes found in refrigerator cookbooks in the 1950s and '60s, fuelled both by enthusiasm and a slight sense of desperation to make refrigerator cuisine different or modern. The recipes in *Prestcold Catering* (published at around the same time as their machine was redesigned as the award-winning modern Prestcold Packaway refrigerator) firmly meet the criteria of what Roland Barthes called 'ornamental cookery'.⁵¹ Prestcold openly talked about creating 'Food Fashions' using the refrigerator to recreate recipes such as Chicken Kief (sic), which was coincidentally also destined to be the first British ready meal in 1979. Dishes showcasing the alchemical transformation of ingredients into an almost unrecognizable finished meal often dominated these manuals. Many were served up as flabby, glazed, jellied and iced foods, flooded with aspic and in some cases presenting an image of food 'freshness' which belied the ingredients. According to a pithy Barthes, these dishes were

fleeing from nature thanks to a kind of frenzied baroque (sticking shrimps in a lemon, making a chicken look pink, serving grapefruit hot), and on the other, trying to reconstitute it through an incongruous artifice (strewing meringue mushrooms and holly leaves on a traditional log-shaped Christmas cake, replacing the heads of crayfish around the sophisticated bechamel which hides their bodies).⁵²

While it might look whimsical to today's eyes, the recipe for Egg Toadstools was signposting the Prestcold refrigerator as a modern machine by showcasing a modern style of cuisine. It was also laden with ingredients that until relatively recently had been controlled under continued post-war rationing. (If you're wondering how my modern testers received this one, it was judged as being tasty.)

After the burst of mid-twentieth-century optimism, when fridge owners were encouraged to use their refrigerators to create not just dishes but 'cuisine', we are back to a situation today in which our main use of them is to store fresh ingredients, ready meals and snacks.⁵³ The purported freshness of our refrigerator contents is as debatable as those displayed in the 1950s, with their cuisine of faked freshness. Are the foods we use and keep in refrigerators today any fresher? Foodstuffs can be labelled as 'fresh' when they have been rapidly frozen, kept frozen for a year and recently defrosted. In turn it is interesting to consider what future food historians might make of our present-day refrigerated habits. How will our often overstuffed refrigerators, food waste, preponderance of pre-packaged ready meals, or present-day taste for voguish liquid nitrogen ice cream⁵⁴ – produced as a 'spectacle' on the BBC's *Masterchef* programme and served in dedicated ice cream parlours – be regarded by those reflecting back on our food culture and refrigerator cuisine?

7 'IS THERE *HEALTH* IN YOUR REFRIGERATOR?'

Over the past hundred years, one of the prime assumptions made about refrigerators is that using them has evident benefits to human health. All of the fancy refrigerator cookbook recipes count for nothing if refrigerators don't do what they're meant to do and keep perishable food cold enough for long enough. The main reason households eventually 'bought in' to refrigeration was not because they wanted to chill champagne, store cheese or churn out hundreds of ice cubes in one go but because they were persuaded that they needed a refrigerator to keep their food healthy and safe. In temperate climates like Britain, where the average mid-twentieth-century housewife was happy with a larder, it took some doing to persuade them to buy a refrigerator, according to Marguerite Patten, one-time demonstrator for Frigidaire.¹

Promoting the food safety and hygiene benefits of refrigerators involved their demarcation as a visibly distinct 'product' from earlier iceboxes. The new, white, sleek, streamlined refrigerators available from the late 1920s were perceived as being more germ-free and health-giving than older models because of their look. The whiteness of their external and internal finishes was explicitly linked to the notion of a more hygienic machine, embodying health and cleanliness and easier to clean than the darker, polished wooden finish of older machines and iceboxes.² The aesthetic of such machines nicely complemented the new elite ideals of 'modern' living plugged by Le Corbusier in his 'Manual of the Dwelling', realizable for the very few and setting

apart those who could achieve a clean, white home and those who could not.

Looking back to the nineteenth century reveals that the hygienic qualities of refrigerators were not such a new pre-occupation at all. While it was convenient for manufacturers to demarcate cleanliness in a very physically obvious way between old and new machines, glimpses of the same aesthetic concerns are found in icebox adverts. These were flaunted in their day as being just as revolutionary and modern in terms of preserving the health of the household as newer electric and gas machines were by the 1920s. 'Is there *health* in your Refrigerator?' a Leonard advert asked, advertising their varnished wooden icebox refrigerators as being as hygienic as 'a Clean China Dish'.³ Another icebox used 'white opal glass' to self-professedly make the 'cleanest and most sanitary lining known', while their ice-powered circulation of 'pure, cold, dry air' kept 'foods in their original freshness and wholesomeness'.⁴ The name of the Kleen Kold refrigerator, with its ubiquitous white interior, did not need any interpretation. A Monroe icebox, in an advert that could have been written for Raymond Loewy's modern, streamlined Coldspot over twenty years later, had food compartments made from one piece 'strictly sanitary . . . snowy-white Porcelain'.⁵ Household manuals were adamant that such one-piece porcelain interiors were essential to preserve not just the 'sanitation of the home' but the 'consequent sanity of the world'. Joints where dirt could lurk 'presage disease and death'.⁶ Getting rid of dirt, the theory went, is easier if scrubbing a white surface – you can see when it's gone. It's not a huge leap of imagination or faith to equate cleaning away dirt to making something hygienic. Scrub the kitchen clean and you scrubbed away, temporarily, the anxiety that it might contain disease-inducing dirt and germs. Given the perceived dangers, this was a heavy responsibility indeed.

Cleanliness wasn't just seen as an aesthetic quality. Behind the notions of the refrigerator as a hygienic machine lay a heady mixture of both scientific thinking around bacteria and hygiene and a moral campaign linking personal standards of cleanliness to the aesthetics of hygiene. This proved to be a persuasive combination, compelling people to adopt more hygienic cleaning rituals by instilling a sense of guilt and anxiety about dirt and

cleanliness. While dirt in itself does not threaten health and is not synonymous with hygiene and freedom from disease, it was increasingly seen as such from the late nineteenth century.⁷ The potential danger posed to human health by some bacteria was well known by the late nineteenth century. Scientific research into bacteria, germs and disease had revealed that the invisible monsters to worry about were not the miasmatic ones apparently carried in the air, but the microscopically small ones spread from surface to surface, carried by hands and flies and in dirt. The sentiments of the saying 'Cleanliness is next to Godliness', despite first appearing in English literature in Francis Bacon's writings hundreds of years earlier,⁸ were well and truly inculcated into moral teachings in the Victorian period.⁹ Middle-class social reformers were at the forefront of a movement to educate the general public to adopt more hygienic practices and cleaning regimes in the home. They picked up the strands of both earlier public health reforms and an increasing preoccupation with the scientifically proven link between bacteria and disease. It was also embodied in the emotive rhetoric used to teach

Given contemporary concerns about adulterated dairy produce it is no wonder that this 1920s seller is promoting his 'Pure Dairy' ice cream.





housewives and schoolgirls (future housewives) that it was their particular responsibility to safeguard the health of their homes and families.¹⁰

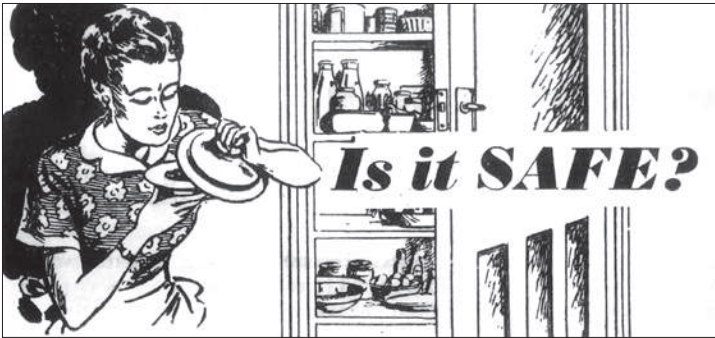
This was a theme taken up by early refrigerator manufacturers. In part this was because early twentieth-century legislation targeted at dangerous additives to food and food safety in general got rid of a number of dangerous preservatives previously used to extend the life of and to mask and disguise unfit and disease-ridden food.¹¹ Foodstuffs on the verge of becoming rotten sometimes had their decaying or ‘adulterated’ state masked by being frozen or by the addition of preservatives or fillers and were sold in this state to unsuspecting consumers. Such unpleasant additions to foodstuffs as boric acid (better known today as an insecticide, as an antiseptic and sometimes an ingredient in embalming fluid), previously added in generous quantities to cream, were banned; their unchanging Dorian Grey effect on foods was no longer acceptable.¹² Similarly intolerable now was red lead, which had been used within living memory in cheese to give it colour, and arrowroot, which had been added to milk to thicken it. A crackdown on the ingredients used in foodstuffs was certainly necessary. For example, the list of ingredients found by Victorian London Medical Officers in

‘Le Péril Blanc: Le Lait falsifié’, c. 1910. This French image highlights the perils of adulterated milk as ‘The White Peril’.

ice cream included such unforgettable nasties as 'cocci, bacilli, lice, bed bugs, bug's legs, fleas, straw, human, cat and dog hair'. The unlucky recipients were at risk of diphtheria, scarlet fever and diarrhoea if they didn't evade the hidden dangers waiting within.¹³ It is no wonder that early refrigerator cookbooks contained so very many ice cream recipes to make at home.

The banning of these additives aided and abetted the sales ambitions of refrigerator manufacturers. Refrigerators could provide the longer life of foodstuffs in the place of these outlawed additives. Refrigeration had been proven to delay the work of the 'bacteria of decay and putrefaction'. Keeping food fresh and hygienic for longer was widely promoted as one of the new machine's 'health-giving' benefits.¹⁴ Manuals carried emotive images showing just how fast food could decay outside of the refrigerator. These were backed up with scientific findings pronouncing safe temperatures for storing various foodstuffs and describing just how fast bacteria could grow on food if left out.¹⁵ Refrigerator advocates such as the Electrical Association for Women conveyed detailed food storage advice as part of their explicitly educative and promotional remit. Their *Electrical Handbook for Women* (1934) told women that to keep food in good condition and 'free from bacteria', a dry atmosphere and a temperature of between 35°F and 48°F was 'essential'. In other words, buy a (electric) refrigerator.¹⁶ Why? Because it was virtually impossible to achieve a low enough constant temperature to keep food safe in iceboxes, even with the best insulation and build quality, since the ice was constantly melting. Experiments comparing both powered and icebox refrigerators showed dramatic differences in internal temperature. While the electric refrigerator kept a temperature between 41°F and 45°F, temperature was much higher in the icebox, varying between 59°F and 68°F.¹⁷ Consumers were told that new powered refrigerators like the Monitor Top made it 'safe to be hungry'.¹⁸

You would be hard pushed to find either an icebox or refrigerator manual that does not mention their food-safeguarding role. In most the sentiment is clear – a familiar mixture of scientific justification for the need to keep food preserved at low temperatures with a rhetoric of responsibility and guilt aimed at the housewife who was told it was her duty to protect her family from the danger of contaminated foods. Such scare tactics,



The menacing 'film noir' quality of this advert from the EDA's refrigerator cookbook *The Art of Cold Cookery* (1960) is striking. The message is clear and unforgettable – you can't trust the safety of the food taken from the larder.

employed in adverts, promotional and educational material, had a powerful effect. Sometimes the warnings were gently given, with 'cosy' adverts portraying mothers dishing out treats from the refrigerator. But often advertisers played the guilt card more strongly with dire warnings about the potential health risks and dangers posed, especially to children, by contaminated or improperly kept food. The Electrical Development Association was typically direct. Its popular electric refrigerator handbook, *The Art of Cold Cookery*, made sweepingly broad and pointed statements, bolstering the position of the 'Electric Refrigerator' as 'The Safeguard of your Health'.¹⁹ The book's section on bacteria is accompanied with striking illustrations with a brooding and shadowy 'film noir' quality. A woman gingerly lifts the lid on a dish of food that has presumably been stored in the larder behind. 'Is it SAFE?' the reader is asked. A detailed description hammers home the potential danger of bacteria to food and health, as they can, the reader is told, divide in just twenty minutes under ideal conditions:

Unless you have the opportunity of looking at bacteria through a strong microscope, you will hardly believe that such small cells exist . . . Don't take too much comfort from this, however, and think that such minute specks can do very little harm. These specks, or rather cells, multiply quicker than any other known form of plant or animal life.

Manufacturers and public bodies alike unashamedly used this fear factor to persuade people that refrigerators were vital to help them preserve the health of their family. There was no better button to press than to brand the refrigerator as

'a citadel of health', as one Brisbane newspaper did.²⁰ Adverts after advert through the 1920s to the 1960s show family scenes with a quality of intimate but very posed composition. They often portray a mother (or a housemaid in earlier adverts) lovingly doling out glasses of safe, fresh, hygienic, cold milk to a child. In a typical early Frigidaire advert, a father watching benevolently over the mother-child pair from the sidelines completes the family portrait. The strapline: 'A drink to the health of the Family'.²¹ In other countries the safety of milk was apparently taken even more seriously. In 1950s New Zealand, for example, it was a criminal offence to sell milk that hadn't been stored in a refrigerator.²² Sometimes the husband or father in adverts is replaced by a covetous friend, evidently wishing that she could provide for her family in the same enviable fashion with such a desirable modern refrigerator.

Flies, bacteria, dirt, decay. All of these were things manufacturers, educators and public bodies said you could mitigate against, if only you bought a refrigerator. Did people buy this message? Refrigerator sales suggest that it certainly didn't hurt – going up when there was a hot summer and the risk of food spoilage and poisoning greater. Manufacturers were quick to exploit any concerns. The *Prestcold Post* issued a dire warning in the form of posters for their salesrooms after the particularly hot summer of 1959.²³ A tabloid-style fantastical headline, 'World 47 Feet Deep in Flies', greeted visitors to the salesroom.



A mother in Brooklyn pouring milk for her children. The children drink more than a quart apiece daily. Photograph by Arthur Rothstein, 1942.

Prestcold declared that this would be the result in a year's time if 'ideal breeding conditions' were met. After a stomach-churning description of the fly's habits, which included vomiting up previous meals and a well-known liking for refuse and excrement, together with a close-up illustration of the fly in action, the solution suggested, of course, is to keep food safe in one of their refrigerators. The article generated Prestcold's strongest sales up to that time.

But there are also hazardous downsides to the domestic refrigerator, which reveal that it isn't always an especially domesticated appliance. The majority of these hazards were and still are caused by improper care and neglect: you misuse it at your peril. Refrigerators are not in themselves guarantors of safe food. There are health risks if you fail to install or maintain a refrigerator or an icebox properly or, in the case of the icebox, if you used contaminated ice. New refrigerator and icebox owners were warned in strongly worded terms against making potentially fatal errors such as connecting the refrigerator to the kitchen drainpipe or allowing the supply of ice in the icebox to melt away. Install an icebox wrongly and the penalty could be severe: 'perfect refrigeration is as necessary to good health as perfect ventilation. A poor icebox refrigerator will sow the seeds of disease and death as actively as sewer gas,' the price saved in purchasing a cheap model cancelled out a 'hundred fold' by the bill from the 'physician or the undertaker'.²⁴ You were in danger of drinking wastewater 'impregnated with gases and foul air' if you installed it badly. At best you faced the 'constant annoyance' and 'wholesale destruction' of your umbrellas to use as 'wires for cleaning the [drainage] pipe'.²⁵ Owners were not aware of the potential dangers of some of the materials used to build their iceboxes. The 1907 edition of Mrs Beeton's *Book of Household Management*, for example, recommends purchasing an icebox insulated with asbestos.²⁶

Many early refrigerator and icebox owners were preoccupied with the hygienic state – or otherwise – of the ice used in their machines. Their wariness was unsurprising, as early experiences of refrigerated food and supplied ice were not always positive. Large ship-based refrigerators were not always kept in a good operating state, the result being that foodstuffs were sometimes cooled to too low a temperature, or conversely not cooled

enough. One nineteenth-century fruit shipper who arrived in London to check on his imported produce described the state of the air-cooled refrigerator used for the voyage: 'the air inlets were all frozen up with icicles, while other parts lower down were blue mouldy.'²⁷

Today, refrigerator mould is still on the minds of many. American comic 'Weird Al' Yankovic's 1993 song parody 'Livin' in the Fridge' featured a swelling and pulsating lump of green mould akin to the 'blob' in the Steve McQueen film of the same name. The song's success was due in part to its parodying of a popular Aerosmith tune and lyrics, but also because it struck a chord with our modern lifestyles. There can not be many people who have never had to throw away mouldy food from their refrigerators. Although refrigerators appear to put much of our food into a kind of suspended animation, the apparently inviolable and everlasting nature of this is misleading. Keep food in there too long, keep it in the wrong place, fail to allow air to circulate by stuffing it full, and you're playing Russian roulette with your health. For example, refrigerator doors – where most of us keep our milk – are probably one of the worst places within the machine to store it, subject to fluctuations in temperature when the door is opened for a period of time. A newspaper recently invited food writers and the public to come clean about the forgotten horrors lurking at the back of their refrigerators. The list produced included 'furry beans', 'liquefying cabbage', 'stinky chicken', rock-hard citrus fruit, numerous plastic containers of meat, pasta and fish of 'uncertain age and provenance' and a lot of gently fermenting and fuzzy fruits and vegetables.²⁸

Kept properly in a refrigerator, food is probably safer to eat than it's ever been, although it's hard to say how many lives refrigerators have in fact saved. They safely preserve medicines and vaccines, which would have unacceptably short shelf lives without them. It's easier to say what foodstuffs might be most likely to cause harm. While adulterated and contaminated milk was the food pariah of the twentieth century, meat and raw fish tales dominate today's food poisoning stories. The refrigerator is a Janus-faced appliance – both villain and superhero in the battle against the spread of many of the bugs responsible for food poisoning: *Salmonella*, *E. coli* and *Campylobacter*. Keep food cold enough in the fridge and you slow down the

reproduction of these bacteria. The longer the door is left open, or the longer the machine is turned off – in a power cut for example – the greater the chance that the food inside will reach the temperature danger zone (roughly between 40 and 140°F, or 4 and 50°C) within which bacteria can multiply most rapidly. But a refrigerated food chain brings its own food safety problems precisely *because* refrigeration has enabled and encouraged us to eat larger quantities of the foodstuffs such as meat and eggs that are more likely to harbour bacteria. Within a complicated food supply cold chain that has multiple links and handlings along it and is totally reliant on maintaining the right temperatures over extended time and distance, there is great potential for bacteria to multiply under the right conditions. Because of this, bacteria can now potentially travel the world with relative ease, with outbreaks of food poisoning as likely to originate thousands of miles away from their victims as round the corner.

While most refrigerator deaths are connected to food poisoning cases, they are also associated with the more dramatic but exceptionally rare cases of death caused by refrigerator electrical fires or escaping refrigerants. Because safer, less toxic refrigerants are used today, instances of poisoning are extremely rare. In the early days of refrigeration, the danger posed by toxic, irritant refrigerants was a real one, although it was more likely to be workers in large industrial cold stores that were affected than a householder. Consumers were still concerned, however. Given that their most likely encounters with gas were either via their gas-powered home heating and lighting (which brought regular spectacular newspaper reports of deaths and fires associated with gas leaks) or through reports of the deadly use of poison gas in the First World War, this apprehension was understandable.

Tragically, ‘refrigerator death’ is also an accepted term for death caused by physical entrapment within the machine. Why? The refrigerator’s solidity and inviolability proved to be a hazard as well as strength. Early refrigerator doors had external latches fitted that could not be opened from the inside. As these deaths almost invariably involved children, they truly caught the imagination of a horrified public in the mid-twentieth century.²⁹ Stories abound at this time of children getting locked inside machines – tragic victims of games of hide and seek gone wrong. Public concern in America eventually led to the



This early Kelvinator electric refrigerator uses toxic sulphur dioxide refrigerant.

legislative banning of these latches in the late 1950s.³⁰ After years of inaction the embedded magnetic strip still used to keep refrigerator doors shut today was speedily invented. Accidents did not stop occurring, however, as many people owned older machines which were not outlawed.³¹ The fear of these deaths in the UK prompted the making of one of the most terrifying public information films of the twentieth century: the 1971 *Children and*

REFRIGERATOR

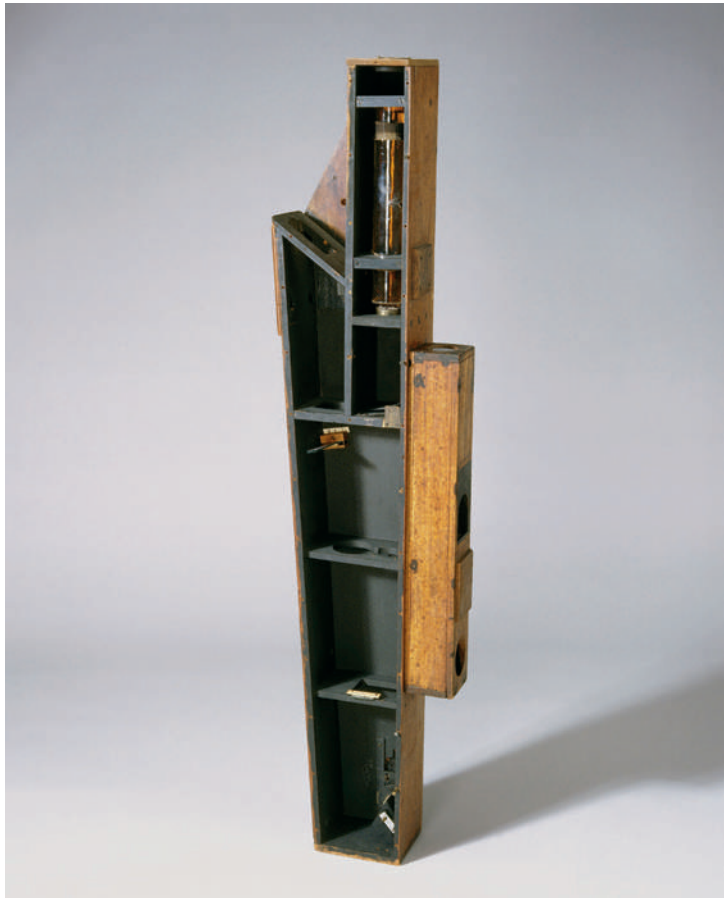


James Lovelock pictured with the original gas chromatograph used on board the RRS *Shackleton*, c. 2014. It contains the sensitive electron capture detector.

Disused Fridges. An abandoned fridge, the film says, captures a child's imagination in the wrong way. It was seen by children not just as a good place to play hide and seek but as 'a caravan, a ship, a castle', rather than the death trap it was: 'airtight and impossible to open from the inside'.³² The tragic deaths of these young children, who when found often initially looked as though they were peacefully sleeping inside, presents a disturbing and twisted contrast to the contemporaneous growing interest in cryogenically freezing the bodies of those who were playing their own game and using refrigeration to try and 'cheat' death to be resurrected at some future date.

Refrigerators were also inadvertently responsible for one of the most calamitous environmental disasters of recent times and certainly one of the worst man-made ones ever. With tales of poisonings and deaths from ammonia, sulphur dioxide and methyl chloride in particular alarming people, scientists started the hunt for safer refrigerants. In 1928 Thomas Midgley developed his 'miracle compound' – colourless, odourless dichlorodifluoromethane or 'Freon' – which was one of a

family of chlorofluorocarbons more familiarly known as ozone-depleting CFCs.³³ To demonstrate its safety, Midgley dramatically inhaled a good lungful and used it to blow out a candle in front of his American Chemistry Society audience.³⁴ For fifty years or so these non-toxic, stable compounds were seen as the answer to our refrigerant prayers, rapidly becoming the refrigerant of choice for fridges and spray cans the world over. They are also non-flammable and readily convert from liquid to gas and back again: seemingly the ideal substance for a refrigerant. Unfortunately, as was eventually discovered in the 1970s, chlorine gas (which is all too readily released from CFCs) destroys the high atmospheric ozone which protects our planet from damaging solar ultraviolet radiation. These pernicious fluorocarbon gases can stay in the atmosphere for anything from decades to millennia. Their stability – desirable from a refrigerant point of



The original ozone spectrophotometer designed by Gordon Dobson in the 1920s to measure the amount of ozone in the stratosphere. A similar instrument was used by British Antarctic Survey scientists to detect the hole in the ozone layer over Antarctica in 1985.

view – is part of the problem, because unlike the chlorine in swimming pools it does not dissolve and is therefore not washed out of the atmosphere by rain. Instead it survives until it is broken down at height by UV radiation.³⁵

James Lovelock was the first to really detect and measure the amount of CFCs in the atmosphere from the northern hemisphere all the way to Antarctica. The tiny electron capture detector that he invented took eight years to develop. When he took it on board the research ship RRS *Shackleton* in 1972, he was looking to prove (successfully) that local man-made pollution spread globally.³⁶ The instrument is so incredibly sensitive that it can detect a one part in a trillion concentration of CFC chemical. This is the equivalent of detecting a single drop of ink in a pool the size of twenty Olympic swimming pools.³⁷ It took others to recognize the full ozone-depleting significance of his findings.³⁸ Eventually, however, governments set in motion the gradual banning of CFCs under the Montreal Protocol of 1987. This was one of the very few times world governments have come together to agree a cause of action to mitigate against environmental damage.

CFCs banned, it is OK to love the refrigerator once again. Or is it? There are still CFCs in some refrigerators because they were also widely used as a blowing agent to puff up the plastic insulation materials used in the machines' carcasses. Even disposing of refrigerators has its hazards. Ironically, once this refrigerator insulation breaks down, the CFCs that were encapsulated in it and which acted in effect as a CFC sink are released into the atmosphere. Another problem is that the 'ozone-friendly' refrigerants that replaced CFCs, mainly HFCs (hydrofluorocarbons), are greenhouse gases. Their impact is huge as they are still widely used in refrigerator and air conditioning systems around the world. Supermarket refrigerators make up half of the shop's energy consumption and a quarter of their carbon footprint. Despite this, many of them leak HFCs and many do not have doors (a double greenhouse gas whammy), the fear being that refrigerator doors act as a barrier to consumer spending. According to *Ethical Consumer* magazine, if all the HFCs leaked from just one supermarket refrigeration system it would have the same impact on our climate as three thousand return flights from the UK to Australia.³⁹ All of this of course remains largely hidden from the consumer – invisible gases and churned-out



Southerham fridge mountain, early 21st century. At the time the photograph was taken over 70,000 fridges awaited recycling using a machine called the 'Fridge Eater' and removing CFCs under new EU legislation.

wasted heat are as intangible as cold-chain food miles. This disconnectedness is reflected in the current trend in the UK as elsewhere for enormous American-style refrigerators, which is going a long way towards negating any reductions in greenhouse gas emissions and energy use brought about by the increased efficiency of most modern refrigerators.

The ambiguities in our relationships with refrigerators and their health-preserving or life-threatening properties are reflected in our culture. Voracious refrigerators turn the tables on their owners in a number of high-profile films – usually trying to consume their unfortunate victims. In 1980s comedy classic *Ghostbusters* a sinister possessed refrigerator sucks Sigourney Weaver into another dimension, while the once-friendly refrigerator in the claustrophobic thriller *Requiem for a Dream* tries to eat the drug-addled housebound Sara to the chant of 'Feed me, Sara!'. Other films highlight a more contradictory relationship between human and fridge. While *American Psycho* features a grotesque refrigerator storing a severed human head next to dessert, just one 's' away in the desert, a lead-lined refrigerator equally fantastically saves the life of Indiana Jones, who seals himself into one to escape the effects of a 1950s Nevada nuke

REFRIGERATOR

test. Past, present and future refrigerators and refrigerator use are problematic, then: linked to hazards, possibilities and health advantages galore. Our relationship with them is simultaneously ambiguous, ambivalent, deeply interconnected and mutually reliant. We find ourselves in the midst of a complex and sometimes uneasy relationship with our refrigerators which can be saviour, killer or sometimes even both at the same time.

8 REFRIGERATED WORLD

Over time, in tentative fits and starts or in fabulous fanfare bursts of innovation and engineering, the world has become increasingly refrigerated. Refrigerators' originally trailblazing use for food preservation and preparation purposes are now accepted as necessary parts of everyday life. But while the focus of the book has been on our domestic machines, refrigerators have historically been and are increasingly used for a vast array of purposes. In an age in which we are understandably preoccupied with climate change and the other environmental impacts of human practices on our planet, the paradox is that we are progressively turning to refrigeration to cool not just food but all sorts of other products and processes.

To today's eyes, refrigerators appear in unfamiliar forms and in unexpected places with unexpected functions. We are no longer familiar with many older technologies and methods of refrigerating and removing heat, which when viewed through modern eyes often seem strange and unfamiliar. Traditional and often culturally specific cooling methods such as earthenware water coolers like the Sudanese example pictured overleaf, cooling shaded desert walls used to create ice, iceboxes and icehouses seem antiquated, for all their beautiful simplicity.

We often overlook refrigerators when they are right under our noses, taking the technology for granted. Symbolic of this is the way unwanted and redundant machines are, today, often simply dumped on British streets. In the mid-twentieth century this would have been unheard of: fridges were far too valuable



Early 20th-century Sudanese water-cooling vessel. Wetting the outside of the pot ensures that evaporative refrigeration releases heat from and chills its contents. Originally displayed at the Science Museum's Refrigeration Exhibition in the 1930s.

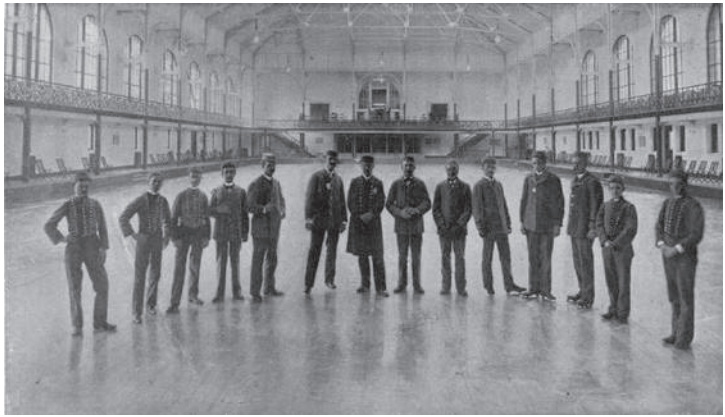
to be thrown away as casually as they are today. Machines were repaired or passed on for others to use.

New refrigerated technology, fast to be adopted and adapted, soon becomes the norm. What were once spectacular engineering rarities become more commonplace. A good example of this is the skating rink. In the early days of industrial refrigeration an artificially-icy skating rink was a feat of engineering. They were certainly a big improvement on earlier ones, such as the 1840s sprinkle of novel artificial rinks with a smelly surface made from a mixture of salts and hog's lard. In Britain rinks such as the Streatham Ice Rink – built in 1931 as London's largest – were made as real prestige pieces designed to impress.¹ Today, no London Christmas event is complete without its own rink, seasonally gracing museums, shopping centres and even school fairs. The world's largest ice rink today – with an area of 20,000 square metres – is also a prestige piece. It opened in Moscow in November 2014, using refrigerators left over from the 2014 Winter Olympics.²

Taking refrigerator at its broadest and most basic definition – 'something that refrigerates',³ moving heat from one place to another – brings a whole new series of things into the refrigerator

REFRIGERATED WORLD

Views of St Nicholas Skating Rink, New York, showing the pipework both before flooding and hidden after the surface has frozen, 1898. From the De La Vergne Refrigerating Machine Company catalogue.



fold. Looked at this way, some of the largest and smallest objects on the planet, and in fact in the universe, are refrigerators. Whole reefer ships are effectively floating container refrigerators. Today's reefers dwarf the first Victorian ones and have been accurately described as 'lumbering lateral skyscrapers'.⁴ One of the current largest – at a massive 333 metres (1,092 feet) long (the length of three football pitches) – houses over 2,000 13-metre- (43-foot-) long refrigerated containers.⁵ Such large-scale projects don't just belong to the industrial era. Huge Persian Yakhchāl earth refrigerators, built from around 440 BC onwards, still pepper the Iranian desert today.⁶ Going up in scale, earth ecosystems such as the frozen permafrost function as natural refrigerators, keeping in a frozen state microbes that would otherwise defrost, releasing carbon dioxide and methane greenhouse gases into the atmosphere. The universe itself could be described, according to the Big Bang Theory, as a giant refrigerator, using its expansion



Gretna - Refrigerating Plant Switch Board - Broomhills.

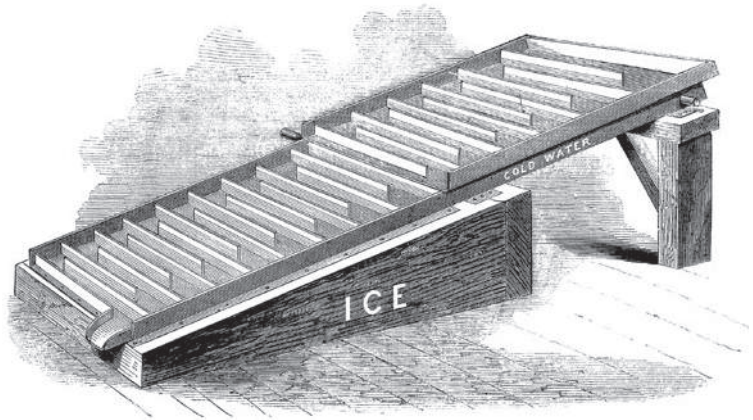
to release heat and cool down.⁷ At the other end of the scale scientists have developed refrigerators 25 by 15 micrometres in size to super cool objects down to -459°F .

Refrigerators have cropped up over time in all kinds of unexpected places and for unexpected purposes, used to cool everything and anything: from industrial processes such as brewing and plastics production and food processing to cooling salmon ova for transport in the Victoria era, cryogenically freezing tissue samples, helping develop medicines such as penicillin, keeping perishable vaccines fresh in hot climates, and cooling spacecraft components, munitions factories, dams and the world's most important scientific experiments. For example, the concrete structure of the Boulder (Hoover) Dam was cooled and cured by 930 kilometres (578 miles) of refrigerating pipe-work when it was constructed in the 1930s. Without these cooling pipes, engineers estimate that it would have taken 125 years to cool the concrete.⁸ Refrigerators cool our food, our medicines, our beer, our buildings, our cars and us (alive and dead).

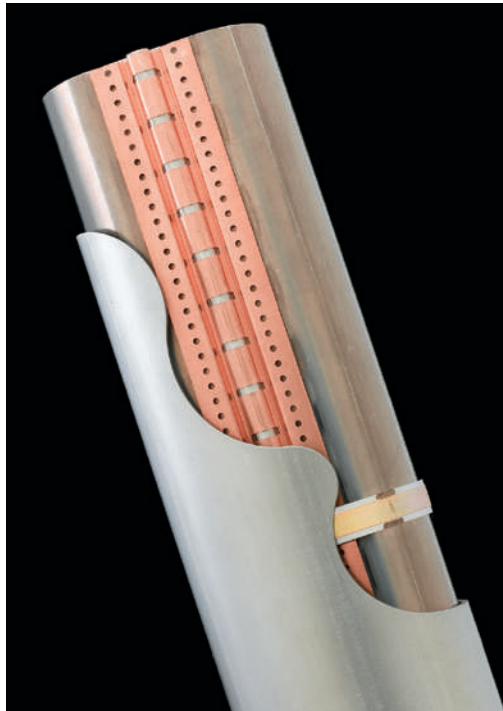
Workers at the Broomhills refrigerating plant, Gretna, Scotland, 1918. Thousands of women risked their lives during the First World War to produce explosive cordite at the factory. Refrigerators ensured that production took place at the right temperature.

REFRIGERATED WORLD

This late 19th-century Clinton's improved beer cooler flowed beer over ice to chill it.



They even cool the world's most cutting-edge computers such as the D-Wave quantum supercomputer, with a predecessor cooled to 0.015 Kelvin (less than -273°C) making it one of the coldest places in the universe.⁹ The world's largest and most famous science experiment – the Large Hadron Collider (LHC) at CERN, which successfully found the elusive Higgs particle – would have been impossible without refrigerators. Multiple elements of the LHC are super-cooled to just above absolute zero to ensure the



CERN's Large Hadron Collider contains the world's largest cryogenic system. Cooling tubes along the sides of over 3,000 beam screens like this one carry liquid helium, cooling the experiment's superconducting magnets to a staggeringly low 1.9 K (-271°C). The cooling process takes weeks.



Liquid-cooled suit from the 1950s developed by the Royal Aircraft Establishment, England, and used under aeronautic pressure suits for flying at high altitude. The cooling pipework is woven through the material.



Astronauts in training using a modern Extravehicular Mobility Unit space suit, c. 2005. One element of the suit is a liquid-cooled undergarment.

superconducting magnets responsible for keeping the protons travelling inside the collider on track work properly, aiding the experiment's search for dark matter.¹⁰

Refrigeration has even made human space walks possible. Modern space suits rely on liquid cooling systems to regulate an astronaut's temperature, which would otherwise be subject to more extreme fluctuations in temperature between sunlight and shadow given that heat cannot be removed by convection.¹¹ The International Space Station also carries a refrigerator and freezer – vital for storing biological experiment samples. Not bad for a technology in which early experimentation included Francis Bacon's apparent attempt to preserve a chicken by stuffing it with snow.

Back down to earth, and within the realm of more common everyday experience, refrigerators have also proved to be an unexpected and extremely successful means of communication and self-expression, acting as social agent and cultural outlet. In 2005 dumped refrigerators also formed the blank canvas and unexpected means of self-expression for New Orleans residents in the flooded post-apocalyptic aftermath of Hurricane Katrina. Forced to leave their homes and belongings, their refrigerators became damaged and as useless as the slowly rotting contents. Their once white exteriors were reappropriated for artistic outbursts of frustration and anger as well as humour in graffiti form. In 2011 a gigantic and unconventional outdoor cinema temporarily graced Hackney's Fish Island as a way of reusing the refrigerators amassing from the London Olympic Park's building site.



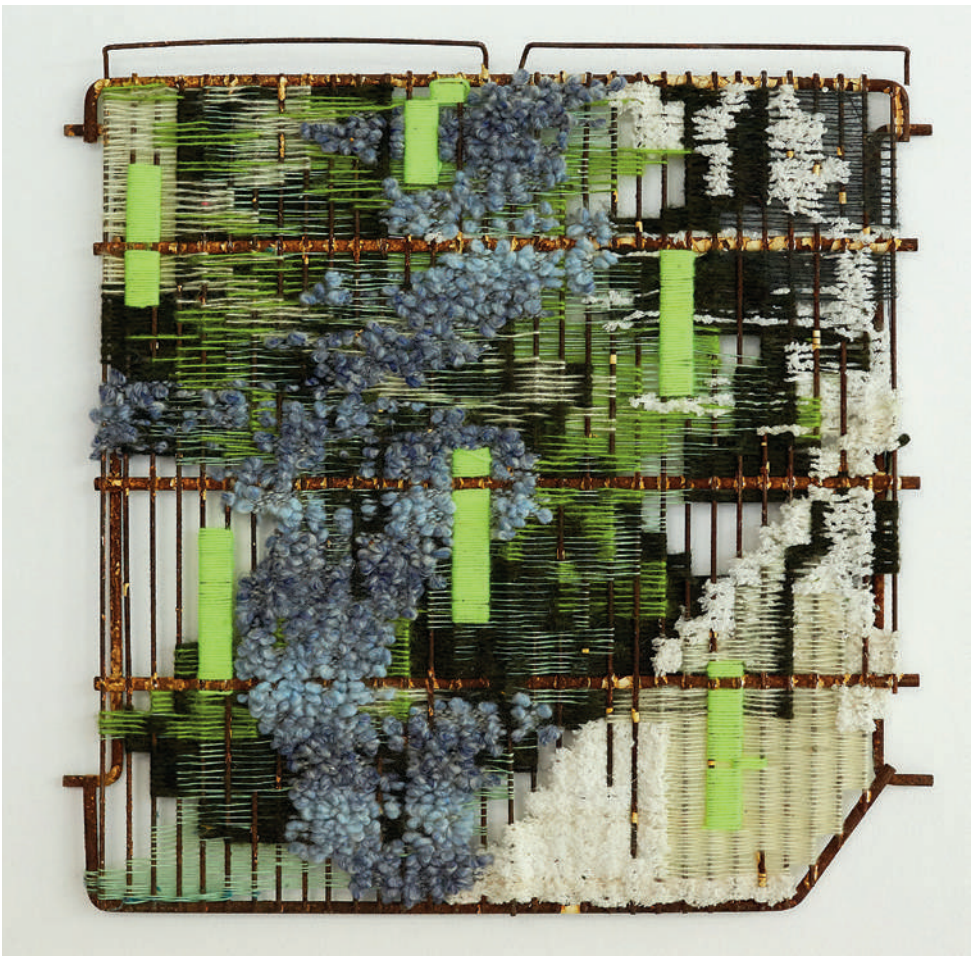
Abandoned refrigerators in the aftermath of Hurricane Katrina, decorated for Halloween.



Refrigerator personalized with a fridge magnet collection and used as a surface for decorative effect.



Mouldy apple puree becomes a photographic artwork.



Fridge grill artwork by Zoë Paul who uses old refrigerator grills for the basis of her wool weavings to explore the impact of the invention of the refrigerator on Mediterranean culture and society.

More commonly, refrigerators have proved to be an unexpected ‘communications centre’ and means of self-expression within the home – their magnetic surfaces now a natural and well-exploited pin board. In an increasingly electronic world full of emails, texts and social media, the fridge door has become one of the few places where we leave traces of ourselves behind in the form of real written messages: a material legacy in an increasingly virtual social world. This is carried to extremes far beyond the odd jotted note in the poignant 2007 best-seller *Life on the Refrigerator Door* by Alice Kuipers. Within the novel a mother and daughter conduct a series of difficult conversations, including addressing the mother’s cancer diagnosis, by a series of notes pinned to the one dependable feature in their lives – the refrigerator.

Visions of a refrigerated future see them not just connecting us to each other, but increasingly to other systems in an Internet of Things. Their connectedness extends far beyond the bounds of

a refrigerator's prime cooling purpose. Manufacturers of domestic machines have been promising useful Internet-linked smart refrigerators since the beginning of the millennium. Machines with display screens that operate as one of many communication nodes in the house – connected to our phones, our shopping lists and even our music – now appear regularly at tradeshow. Consumers, so far, have been remarkably reluctant to buy into such promises to link up your fridge to your tablet and bring music and a party atmosphere into the kitchen. Perhaps those dreaming up refrigerated futures should look to the past because even dreams of a refrigerated *future* have a past. Paralleling the mixed fortunes of the Crosley Shelvador's radio add-on, and the diffidence with which the 1999 Screenfridge, which allowed you to send emails, was greeted, one commentator in 2014 described Internet fridges as the 'zombie idea that will never, ever happen'.¹²

Other past refrigerator dreams usually provide equally fascinating reflections on the preoccupations of society at the time. The many kitchens on display at trade shows and home shows gave the consumer a glimpse of a glamorous, sleek, organized kitchen future that just might be realizable. Some visions were considerably more fanciful than others. Frigidaire's 1955 Kitchen of the Future featured in brochures and even in musical form in the General Motors film *Designs for Dreaming* the following year.¹³ Dancer Tad Tadlock is whisked off by a masked *Phantom of the Opera* mystery man to see Frigidaire's kitchen of the future: a visionary and fanciful choreographed take on what a housewife might expect in her future kitchen. It featured domed cookers with a space age aesthetic reminiscent of much-beloved 1950s imaginary moon bases and flying saucers. Screens displaying a recipe's finished look, automatic whisks and a ceiling of light made from thousands of pieces of aluminium and fluorescent tubes all featured. 'No need for the bride to feel tragic,' the film pronounces as the rotating refrigerator is introduced, because 'the rest is push button magic.'¹⁴ The revolutionary automated appliances would, then-futurologists predicted, save the main kitchen worker – the housewife – a lot of time and effort, a key preoccupation at the time. Future refrigerated dreams extended further than better kitchens. Even time travel was imagined to be effectively possible, if the reawakening of a cryogenically frozen Woody Allen in his 1973 comic classic *Sleeper* was to be

REFRIGERATED WORLD

Cryoplus III cryopreservation unit, Model 8153, for storing cells using liquid nitrogen. 25,000 tubes are inside to keep cells in suspended animation, with vital functions shut down but the cells still live.



believed. Allen's character was revived two hundred years after being accidentally frozen. Although a work of complete fantasy, the film reflected contemporary reaction to the very new process of cryopreservation. The first person to be cryopreserved was university professor James Bedford, who died just a few years earlier in 1967.¹⁵ 'Never Say Die' was *TIME* magazine's succinct assessment at the time, as commentators imagined being a step closer to cheating death.

So what could a refrigerated future hold for *us*? While it often seems that the wackiest refrigerators are those that exist in the mind or at a conceptual stage, many of these have eventually become reality. Quantum refrigerators formed from only three quantum bits (qubits), not so many years ago an unachievable dream, are in the pipeline. Magnetic refrigerators, which use a magnetic field to alternately heat and cool special metals, are also finally in commercial production in the form of Cooltech's Magnetic Refrigeration System. They are capable of achieving ultra-low temperatures without the ozone-depleting refrigerants or energy-guzzling mechanical compressor and its associated noise. In the Netherlands, the industrial designer Floris Schoonderbeek has produced an underground refrigerator that uses no electricity. In form and function it is incredibly

evocative of those early icehouses encountered at the beginning of this book.¹⁶ Even thermoacoustic refrigerators, which use sound waves in a mixture of harmless gases to produce cooling and have few moving parts, have reached the prototype stage.

Like the radio fitted to the 1930s Crosley refrigerator, some of today's emerging novel technologies, designs and fridge features will be lost, while others will become the next generation of accepted and familiar technology. Refrigerators face an undisputed if unpredictable future. Current predictions show widely diverging trends for the types of machines we will have in our homes and impacting on our lives. While regulations increasingly require the production of more energy-efficient machines made from recyclable components, there is also a tendency to include a growing number of features in our refrigerators or to buy 'plus-size' models that in effect counter any efficiency savings. Other cultures and countries are fully embracing the freedom and the choice domestic refrigeration brings with it for the first time. Unsurprisingly, refrigerators are desirable consumer goods in the relatively new markets of China, India and elsewhere, with factories shifting locations to suit. In China, which is investing large sums in developing more environmentally friendly domestic appliances, the percentage of the population with refrigerators at home rose from 20 per cent to nearly 90 per cent in the decade between 2005 and 2015.¹⁷

As a tonic to all of this energy-guzzling growth and super-sizing, or as a reactionary movement against it, some people are currently moving away again from domestic refrigerators altogether. The American survivalist movement embraces the ideal of self-sufficiency in the event of a catastrophe or Armageddon. Making your own icebox refrigerator is viewed variously as part of being able to cope if modern wired-up systems of electricity and communication fail, or more mundanely as just a way to reduce energy bills.¹⁸ Think this is an insignificant movement? Think again. IKEA's vision of a 2025 kitchen – shown at the high-profile Milan Design Fair in 2015 – envisages a kitchen with no electrical refrigerator at all. Instead it relies on a savvy mix of traditional methods of food preservation such as cooling earthenware pots – such as the Sudanese water cooler seen at the beginning of this chapter – and a 'modern pantry' using induction cooling and shuttling in food only when needed.¹⁹



Yurily Dmitriev's Bio Robot refrigerator designed for Electrolux's 2010 Design Lab competition. Foodstuffs are pushed into cool pockets within the gel structure.

Refrigerator design is becoming ‘smarter’ and increasingly more imaginative. There are incredibly innovative and creative designs emerging from a new antithetical generation of designers and engineers who are being encouraged to totally rethink both domestic and industrial machines. Electrolux’s annual Design Lab (now evolved into the Electrolux Ideas Lab) competition churned out truly inspirational plans for new machines, refrigerators among them. Recent years have seen models using new technologies and materials. The finalists for 2010 included a concept design for a slim Bio Robot refrigerator: food items cooled by the bioluminescence of the biopolymer gel are simply plunged by hand into the biopolymer gel that morphs around the food. Similarly, more simple solar-powered refrigerators are being used to keep vaccines cool in hot countries.²⁰ These real and imagined machines, unlike the superficially futuristic glossy (and feature-packed) styles currently cloaking the familiar form and function of many of today’s domestic machines, are the ones truly exemplifying the possible futures of refrigerators for our homes. Whatever form they take, however, and whatever smart new cooling technologies they employ, the function they perform is one we cannot, in our modern world, do without. The refrigerator is here to stay and the future’s cool – in every sense of the word.

REFERENCES

INTRODUCTION

- 1 Alton Brown, American comedian and presenter of *Good Eats* for the channel Food Network, interviewed in 2005. “‘Good Eats’ Guru Alton Brown Talks About His Heat Thing’, www.channelguidemagblog.com, 16 September 2005, accessed 20 February 2016.
- 2 It was given its fuller name, the Royal Society of London for Improving Natural Knowledge, by Royal Charter in 1663.
- 3 ‘Domestic powered refrigerator’ and ‘fridge’ are used interchangeably in the book.
- 4 See www.oxforddictionaries.com, accessed 5 May 2014.
- 5 Tara Garnett and Tim Jackson, ‘Frost Bitten: An Exploration of Refrigeration Dependence in the UK Food Chain and its Implications for Climate Policy’, paper presented to the 11th European Round Table on Sustainable Consumption and Production, Basel (2007).
- 6 The Science Museum, London, is fortunate to house one of the world’s best collections of domestic refrigerators.

1 THE ICEMAN COMETH

- 1 An American Victorian visitor would have stood a much better chance of recognizing it, as icebox use was far more widespread in the U.S. in the nineteenth century.
- 2 Jonathan Rees wrote a fascinating article outlining the use of the term ‘refrigerator’ for what we now call the icebox until powered versions were more common. Jonathan Rees, ‘Icebox v.

Refrigerator', www.moreorlessbunk.net, accessed 12 August 2014. The word 'refrigerator' was apparently first used in the context of iceboxes by the American Thomas Moore. Although Moore originally used the term 'refrigeratory', he eventually patented his invention as a 'refrigerator' icebox in 1803. He described the invention in *An Essay on the Most Eligible Construction of Ice-houses: Also, A Description of the Newly Invented Machine Called the Refrigerator* (Baltimore, MD, 1803).

- 3 Merritt Ierley, *The Comforts of Home: The American House and the Evolution of Modern Convenience* (New York, 1999), p. 168.
- 4 Behind the deceptively simple term 'cold chain' lay a long and complicated history and intricate set of processes. The use of 'cold chain' in terms of using cold to preserve food between source and destination probably dates to the early twentieth century. Cold chains are commonly referred to for the transport of foodstuffs and drugs.
- 5 Particularly from Albanus Mons. N. Webster, Jun., Esq., 'A Dissertation on the Supposed Change in the Temperature of Winter', *Memoires of the Connecticut Academy of Arts and Sciences*, 1/1 (New Haven, CT, 1810), pp. 1–68. Contemporary reports suggest that they mainly used it to cool drinks (especially wine) or for cool baths (*frigidaria*) rather than to preserve foodstuffs.
- 6 Canning and refrigeration are also special among methods of preserving food, being the ones which affect the texture and taste of foodstuffs least.
- 7 Earlier in the century, James I had two snow pits constructed in Greenwich, London. Jill Norman, 'Introduction', in Elizabeth David, *Harvest of the Cold Months: The Social History of Ice and Ices* (New York, 1994), p. xv.
- 8 The Royal Society was formed in November 1660 and then granted a series of Royal Charters in the following few years. Founding members included Robert Boyle, John Evelyn and Edmund Waller.
- 9 Hannah Glasse, *The Art of Cookery, Made Plain and Easy* (London, 1767 edn), p. 332. Originally published in 1747, the 1751 edition was the first to feature the 'Additions' section, which included Glasse's recipe for raspberry ice cream.
- 10 By ice she meant not pure ice but the seasonal delight of a Georgian iced dessert made from crushed ice or ice creams, which were becoming increasingly popular at the time. Austen's

REFERENCES

- wealthy brother Edward had an icehouse in his home in Godmersham, Kent. Alan Cooper, *World Below Zero: A History of Refrigeration in the UK* (Aylesbury, 1997), p. 2.
- 11 John Seymour, *The National Trust Book of Forgotten Household Crafts* (London, 1992), pp. 44–5.
 - 12 The American president Thomas Jefferson, who had an icehouse at his estate in Charlottesville, Virginia, estimated that it took sixty wagonloads of ice brought from the nearby river to replenish it each winter.
 - 13 Waller wrote a well-known poem, ‘On St James’s Park’, about the Green Park icehouse, revealing both a personal and a wider shared contemporary fascination with the ability of icehouses to preserve ‘ice, like crystal’ all year round.
 - 14 John Evelyn, ‘An Account of Snow-pits in Italy’, in R. Boyle, *New Experiments and Observations Touching Cold* (London, 1665), pp. 407–9. Evelyn’s account was widely referenced, both at the time and after, appearing in the *Illustrated London News*, for example, in 1845. Later, icehouses and caves were usually brick-lined while they commonly also had a dome-shaped roof structure above ground.
 - 15 Andrew Wynter, *Our Social Bees; or, Pictures of Town and Country Life, and Other Papers* (London, 1865 edn), pp. 248–9. Originally published in 1861.
 - 16 ‘Ice: Its Production and Application’, *Illustrated London News*, 11 July 1863, p. 51.
 - 17 *Illustrated London News*, 17 May 1845, p. 315.
 - 18 There is consensus that there was a period of overall climatic cooling between the sixteenth and nineteenth centuries. Although the actual impact varied, Europe and North America experienced colder winters, with recent research suggesting that other parts of the globe, including Australasia and South America, also experienced general cooling.
 - 19 Jonathan Rees rightly highlights Tudor’s great legacy to our modern-day fridge culture, because ‘nobody before Frederic Tudor had ever conceived of a cold chain.’ Jonathan Rees, *Refrigeration Nation: A History of Ice, Appliances, and Enterprise in America* (Baltimore, MD, 2013), p. 14.
 - 20 After this initial loss-making foray (with a loss of \$4,500) and – to précis what was an extremely long story and torturous personal journey for him – Tudor learnt from a series of

unprofitable ventures and gradually developed an ice exporting trade of global reach. His story has been entertainingly told by Gavin Weightman in *The Frozen Water Trade* (New York, 2003). Tudor also recorded thoughts about his business in his *Ice House Diary* (1805–22).

- 21 'Frederic Tudor, Ice King', *Proceedings of the Massachusetts Historical Society* (November 1933), www.iceharvestingusa.com, accessed 20 February 2014.
- 22 Bodil Bjerkvik Blain, 'Melting Markets: The Rise and Decline of the Anglo-Norwegian Ice Trade, 1850–1920', *Working Papers of the Global Economic History Network* (2006), p. 2.
- 23 *Illustrated London News*, 17 May 1845, p. 315. The ice was, of course, regularly replenished.
- 24 By 1869 British ice consumption was over 130,000 tons, of which 110,000 tons were shipped in from abroad. London demand accounted for almost half, with much of the rest used in east coast fishing ports to pack fish coming in from the North Sea fleets. Cooper, *World Below Zero*, p. 4.
- 25 *Illustrated London News*, 17 May 1845, p. 315.
- 26 These are still open to visitors today, while the names of some local buildings still reflect the long-dead ice trade. The website even has a webcam where you can view the ice well.
- 27 'London Ice-carts', *Illustrated London News*, 5 January 1850, p. 2.
- 28 Many small lakes and farm ponds in North America and Britain, as elsewhere, were deliberately constructed to provide sources of natural ice.
- 29 In America, January and February were ice-harvesting months, with the ice at between 10 and 18 inches (25 and 45 cm) in thickness. The best temperature for harvesting was judged to be a few degrees Celsius below zero so that the water in the ice cakes would freeze rapidly once removed from the water. R. J. McGinnis, *The Good Old Days: An Invitation to Memory* (New York, 1960), pp. 121–2.
- 30 *Illustrated London News*, 17 May 1845, p. 315.
- 31 Wynter, *Our Social Bees*, pp. 245–6. Wynter gives one of the most detailed descriptions of ice harvesting. For a modern description see Paula Tracey, 'Meet the 860-year-old Master of the Ice Harvest', www.wmur.com, accessed 13 February 2013.
- 32 Much of this equipment was invented by the American explorer, trader and inventor Nathaniel Wyeth, who was for some time

REFERENCES

- Frederic Tudor's foreman. Jill Sinclair, *Fresh Pond: The History of a Cambridge Landscape* (Cambridge, MA, 2009). Wyeth also invented an above-ground icehouse that was double-walled for insulation.
- 33 *Illustrated London News*, 17 May 1845, p. 315. 'cwt' or hundredweight is the terminology used as a measure of weight for both American and imperial systems. In the American system it equates to 100 lb (or approximately 45.4 kg) while in imperial it equates to 112 lb (50.8 kg). It is unclear whether the 2 cwt mentioned here refers to the American or imperial system, although as the article is in a London newspaper the assumption might be imperial. The size of ice blocks cut often varied depending on the distance that the ice was transported, with larger blocks surviving better on longer journeys. Wenham typically cut their blocks to be 21 inches square by 12 to 18 inches (53 square cm by 30 to 45 cm) deep.
- 34 Wynter, *Our Social Bees*, p. 245.
- 35 *Illustrated London News*, 17 May 1845, p. 315.
- 36 The rhetoric of cleanliness and purity reappeared in later twentieth-century adverts for iceboxes and powered refrigerators.
- 37 By contrast, the often dull and dirty appearance of indigenous ice was viewed with distrust. Evidence suggests that American Wenham ice was unusually pure. Contemporary drinks recipes featured Wenham ice as an ingredient in cocktails – evidently viewed as safe enough to consume.
- 38 *Illustrated London News*, 17 May 1845, p. 315.
- 39 Jullien is widely regarded as the inventor of promenade concerts. At the time, he was well known as a conductor of dance music – particularly for Queen Victoria. His musical exploits were regularly satirized in *Punch* magazine, which accused him of having inoculated British countesses with dancing 'Polkomania'; see Charles L. Graves, *Mr Punch's History of Modern England*, vol. 1: 1841–57 (London, 1921), p. 212.
- 40 *The Times*, 1 July 1846, p. 4.
- 41 Soyer was at the vanguard of introducing modern technologies – including refrigeration – into the kitchen. F. J. Clement-Lorford, *Alexis Soyer: The First Celebrity Chef*, www.academia.edu, 6 March 2015.
- 42 *The Times*, 16 October 1844, p. 7.
- 43 Wynter, *Our Social Bees*, p. 251.

- 44 *Illustrated London News*, 17 May 1845, p. 316.
- 45 Isabella Beeton, *The Book of Household Management* (London, 1861), p. 756; and *The Book of Household Management* (London, 1907), p. 72.
- 46 Ethel R. Peysner, *Cheating the Junk-pile: The Purchase and Maintenance of Household Equipment* (New York, 1922). The book contained reprinted articles from *Home and Garden* magazine.
- 47 Merritt Ierley, *The Comforts of Home* (New York, 1999), p. 168. A cubic foot of ice weighed around 57 lb (25 kg). It would probably need replenishing every few days.
- 48 Sarah A. Chrisman, *This Victorian Life: Modern Adventures in Nineteenth-century Culture, Cooking, Fashion, and Technology* (New York, 2015), pp. 125–33, available at www.thisvictorianlife.com.
- 49 The 1907 *Army and Navy Stores* catalogue was republished as a facsimile edition titled *Yesterday's Shopping* (Newton Abbot, 1969), pp. 183, 211, 599, 944.
- 50 These ice-box refrigerators often featured clean, white interiors, lined with substances such as mineralite.
- 51 *Illustrated London News*, 17 May 1845, p. 315.
- 52 'Dublin History and Culture', *Shanachie Magazine*, vol. III (1998).
- 53 One of the causes of death of soldiers in the war was badly preserved food.
- 54 *Ann Arbor Argus*, 6 July 1894, p. 7.
- 55 *San Francisco Call*, 8 June 1890, front page.
- 56 Blain, 'Melting Markets', p. 23.

2 THE BIRTH OF COOL

- 1 British Electrical Development Association (BEDA), *Electric Domestic Refrigerator Handbook: A Guide to Practical Maintenance*, 2nd edn (London, 1952), p. 1.
- 2 Alan Cooper, *World Below Zero: A History of Refrigeration in the UK* (Aylesbury, 1997), p. 4. From the 1880s onwards the use of artificial ice and refrigerators on an industrial scale really kicked in.
- 3 W. R. Woolrich, *The Men Who Created Cold* (New York, 1967), p. 7.
- 4 Cooper, *World Below Zero*, p. 27.
- 5 Woolrich, *The Men Who Created Cold*, contains useful short biographies of many of the main contributors to refrigeration development in the eighteenth and nineteenth centuries.

REFERENCES

- 6 Elizabeth David, *Harvest of the Cold Months: The Social History of Ice and Ices* (London, 1994).
- 7 See Cooper, *World Below Zero*; Woolrich, *The Men Who Created Cold*; and R. Thévenot, *A History of Refrigeration Throughout the World* (Paris, 1979).
- 8 Ruth Schwartz Cowan, 'How the Refrigerator Got its Hum', in *The Social Shaping of Technology: How the Refrigerator Got Its Hum*, ed. Donald MacKenzie and Judy Wajcman (Manchester, 1985), p. 204.
- 9 H. T. Pledge, *A Five Year Bibliography of the Applications and Testing of Refrigeration, and of its British Patents, 1929–1933* (London, 1934).
- 10 Also known as the Great London Exposition.
- 11 Perkins was granted a patent for an 'Apparatus and means for producing ice, and in cooling fluids' in 1834 and for the first practical refrigerating machine (based on vapour compression technology) ten years later in 1844. He is better known for his genius in developing boilers and steam engines. His work built on that of William Cullen, who in 1755 created ice by evaporating ether in a vacuum.
- 12 Basically this ensured that the refrigerant could circulate and was not lost to the system. In Perkins's own words, the machine was: 'An arrangement of apparatus . . . whereby I am enabled to use volatile fluids for the purpose of producing the cooling or freezing of fluids, and yet at the same time constantly condensing such volatile fluids, and bringing them again and again into operation without waste.' *The Repertory of Patent Inventions and other Discoveries and Improvements in Arts, Manufactures, and Agriculture*, New Series, vol. III (London, 1837), p. 15.
- 13 Unlike in Britain, North America and Europe, where natural ice was still the most economical way of cooling goods well into the nineteenth century.
- 14 *Illustrated London News*, 29 May 1959, p. 546. In 1873 Harrison tried to ship 20 tons of beef and mutton from Australia to London on board the ss *Norfolk*. Unfortunately the meat spoiled during the journey. The failure affected public confidence in refrigerated food. Sadly Harrison died penniless in 1893. See Michael Symons, *One Continuous Picnic: A Gastronomic History of Australia* (Melbourne, 2007), p. 103.

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- 15 *Illustrated London News*, 29 May 1858, p. 546. The first machine made to Harrison and Siebe's improved design was sold to London's Truman, Hanbury, Buxton & Co. brewery.
- 16 Eventually Harrison set up ice-making plants and sold his Harrison-Siebe machines, although the businesses evidently struggled. H. G. Goldstein, 'Birth and Growth of the Refrigeration Industry', in *Refrigeration Annual* (1966), p. 41. Harrison also set up the world's first commercial ice-making plant, at Rocky Point on Australia's Barwon River.
- 17 *Illustrated London News*, 29 May 1858, p. 546. Also described in D. Clarke, *The Exhibited Machinery of 1862: A Cyclopaedia of the Machinery Represented at the International Exhibition* (London, 1862), p. 277.
- 18 *Illustrated London News*, 29 May 1858, p. 546.
- 19 Original copies of two of these are held in the Science Museum's collections.
- 20 The German scientist and engineer Carl von Linde carried out much of the pioneering work in compression refrigeration using ether and ammonia. His first machine was installed in a Munich brewery where he also set up Refrigeration Research Institute. He established firms in various countries to make and sell his machinery. See Harry Miller, *Halls of Dartford, 1785–1985* (London, 1985), p. 69.
- 21 Ferdinand carried on the work of his brother, Edmond (whose original machine used sulphuric acid and water). Ferdinand patented his machine, using water to absorb the ammonia refrigerant, in France and the United States of America in 1859 and 1860 respectively. The machine produced an output of 440 lb (200 kg) of ice per hour.
- 22 Basically a gas absorption machine uses a heat source and a chemical gas absorption reaction rather than mechanically driven compression (usually driven by electrically generated power these days) to drive the cooling process. David Banks, *An Introduction to Thermogeology: Ground Source Heating and Cooling*, 2nd edn (Oxford, 2012), p. 92. Carré displayed both an industrial and a domestic model. For a full description of Carré's machine together with some incredibly detailed drawings of all the parts see *The Engineer*, 9 October 1863, pp. 214–16.
- 23 This machine used sulphuric acid instead of ammonia.

REFERENCES

- 24 'Ice: Its Production and Application', *Illustrated London News*, 11 July 1863, p. 51.
- 25 *Catalogue of the 1862 Exhibition*, Class VIII, p. 90.
- 26 'Artificial Production of Ice', *Illustrated London News*, 15 May 1847, p. 318.
- 27 Appearing in the *Catalogue of the 1862 Exhibition*, Class XXXI (Iron and General Hardware).
- 28 'The International Exhibition', *Illustrated London News*, 16 August 1862, p. 194.
- 29 *Ibid.*
- 30 David, *Harvest of the Cold Months*, pp. 172–80.
- 31 Karal Ann Marling, *Ice: Great Moments in the History of Hard, Cold Water* (St Paul, MN, 2008), pp. 71–2. Gorrie's failure to secure funding for his machine sadly contributed to his premature death in 1855. There is some evidence of a smear campaign against him by supporters of the natural ice trade. Gorrie himself suspected Frederic Tudor to be behind it.
- 32 Sue Sheppard, *Pickled, Potted and Canned: How the Art and Science of Food Preserving Changed the World* (New York, 2000), p. 294.
- 33 Nicholas Carr, 'Should the Laborer Fear Machines?', www.theatlantic.com, 29 September 2014.
- 34 Dachang Cong, 'Amish Factionalism and Technological Change: A Case Study of Kerosene Refrigerators and Conservatism', *Ethnology*, xxx1/3 (July 1992), pp. 205–18.
- 35 Carl von Linde really took this technology and ran with it. His first ammonia machine was installed in a beer factory in Munich and he went on to set up firms in multiple countries while engaging in active research as well. His research into the energy efficiency of various methods of refrigeration concluded that compression machines were superior to cold air machines. He also concluded that ammonia was the best refrigerant to use based on its thermodynamic properties, although ammonia was often avoided because of its toxicity.
- 36 The Linde British Refrigeration Company (later Lightfoot) was set up in 1885 to acquire the British patent rights to Karl von Linde's refrigeration method. The Bell brothers and J. S. Coleman were introduced to each other by Lord Kelvin and formed the Bell-Coleman Mechanical Refrigeration Co., underpinned by a number of patents they took out.

- 37 Breweries were especially keen to innovate and adopt new technologies in the nineteenth century. A quick glance at the catalogue for the 1862 International Exhibition, looking for refrigerators, reveals that most of those on show had been developed for breweries. The use of refrigerators allowed brewers to produce beer year-round, yeast being very sensitive to temperature changes.
- 38 Cooper, *World Below Zero*, Preface. Smaller compressors suitable for domestic machines were not invented until the early twentieth century.
- 39 The *Paraguay* – carrying 5,500 mutton carcasses – was fitted out with an ammonia absorption machine by none other than Ferdinand Carré, while the *Frigorifique* used an ether vapour compression machine developed by Charles Tellier.
- 40 *The Engineer*, 28 October 1881, p. 318. Cold air machines were both power-hungry and usually large – so they eventually lost out to vapour compression machines in the late nineteenth century.
- 41 Quoted in Miller, *Halls of Dartford*, p. 67.
- 42 Ibid.
- 43 Science Museum Documentation, scm/1006/75/4.
- 44 For example, the famous London hotel The Ritz installed an ice-making plant in the early twentieth century alongside other high-profile hotels around the world. J. W. Anderson, *Refrigeration* (London, 1908), p. 199.
- 45 *The Times*, 16 June 1886.
- 46 Tara Garnett and Tim Jackson, ‘Frost Bitten: An Exploration of Refrigeration Dependence in the UK Food Chain and its Implications for Climate Policy’, paper presented to the 11th European Round Table on Sustainable Consumption and Production, Basel (2007), p. 8.
- 47 L. C. Auldjo, ‘Mechanical Refrigeration, with Details of an Ammonia Compression Machine, and Description of Various Methods of Refrigeration’, *Minutes of Proceedings of the Engineering Association of New South Wales*, x (May 1895), p. 40.
- 48 Ibid., p. 45. Experts also thought that any moisture absorbed from air circulating in a refrigerator could potentially taint the meat with the lubricants used in the machine. ‘Dry air’ machines by firms like J. & E. Hall which didn’t use toxic chemicals – both mechanical and as iceboxes – proved popular as a result in the late nineteenth century.

REFERENCES

- 49 Ibid., p. 40.
- 50 Lauren Janes, *Colonial Food in Interwar Paris: The Taste of Empire* (London, 2016), pp. 38–9.
- 51 Letter dated 26 December 1838 to *The Farmer's Magazine*, 11/1 (1838), p. 139.
- 52 Charles Dickens, *Oliver Twist, or the Parish Boy's Progress* (London, 1838), vol. 1, pp. 21–2.
- 53 Departmental Committee on Combinations in the Meat Trade, British Parliamentary Papers (PP) 1909 (Cd.4643) xv, para. 7; see also the Report of the Select Committee on Marking Foreign Meat (PP) 1893–4, xii, quoted in D. J. Oddy, 'Food Quality in London, 1870–1938', xiv *International Economic History Congress* (Helsinki, 2006), p. 3, www.helsinki.fi.
- 54 Thea Thompson, *Edwardian Childhoods* (London, 1981), p. 16. Also Anna Davin, 'Family and Domesticity: Food in Poor Households', in *A Cultural History of Food in the Age of Empire (1800–1900)*, ed. M. Breugel (London, 2014), pp. 141–64.
- 55 Brian Roberts, 'Industrial Refrigeration and Air Conditioning, Part 1.2: Cold Store', www.hevac-heritage.org, 14 January 2014.
- 56 De La Vergne, *The De La Vergne Refrigerating Machine Company* (New York, 1898), p. 3. By 1897 the company had 'furnished' seven hundred refrigerating and ice-making machines. This lovely catalogue is kept in the Science Museum's Library and Archives.
- 57 P. Morris, 'An Effective Organ of Public Enlightenment: The Role of Temporary Exhibitions in the Science Museum', in *Science for the Nation: Perspectives on the History of the Science Museum*, ed. P. Morris (Basingstoke, 2010), pp. 212–49.
- 58 T. C. Crawhill and B. Lentaigne, *Guide to the Refrigeration Exhibition: And a Brief Account of the Historical Development of Mechanical Refrigeration* (London, 1934), p. 13.
- 59 *Nature*, cxxxiii (21 April 1934), p. 605.

3 DOMESTICATING COLD

- 1 Ray Charles, 'I'm Gonna Move to the Outskirts of Town', 1960. Written by Andy Razaf, Roy Jordan and William Westley Weldon.
- 2 Kelvinator produced the first automatic domestic refrigerator for the U.S. market in 1918. The name was chosen as a reference to Lord Kelvin – reflecting the importance of his research into thermodynamics.

- 3 Ice delivery costs taken from 'Refrigerating World' (September 1921, p. 12) and reprinted in Alexander Stevenson, *Report on Domestic Refrigerating Machines, 1923–1925* (Schenectady, NY, 1923, with additions in 1924 and 1925), p. 164, www.ashrae.org, accessed 16 March 2016.
- 4 As the development of larger commercial machines had already demonstrated.
- 5 For many households an icebox itself would have been a relatively recent purchase.
- 6 Also, perhaps, because the word 'refrigerator' was yet to be generally associated with the powered version.
- 7 E. A. Sampson, 'Preserving Food in 7,000,000 Homes', *DuPont Magazine* (Midsummer 1936), p. 13.
- 8 A 1934 survey of 63 American cities found that only 17 per cent of households had a refrigerator. See U.S. Department of Commerce, 'Real Property Inventory, 1934', *New York Times*, 26 August 1934.
- 9 Allene Sumner, 'Henry in the Kitchen', *Eugene-register Guard*, 5 October 1928, p. 7.
- 10 Ibid.
- 11 EDA, *Electric Domestic Refrigerator Handbook: A Guide to Practical Maintenance* (London, 1952), pp. 48–55, available at the Science Museum Library.
- 12 Brian Roberts, *Refrigeration and Air Conditioning* (HEVAC, 2010), p. 52, www.hevac-heritage.org.
- 13 Ethel Peyser, 'Keep it Cool in a Good Refridgerator', *House and Garden Magazine* (May 1919), p. 52; reprinted in Peyser, *Cheating the Junk-pile: The Purchase and Maintenance of Household Equipments* (New York, 1922), pp. 106. The domestic adviser's tome was a gathering together of the characteristically tongue-in-cheek material originally serialized in the American *House and Garden* magazine. It included a nine-point plan to help a housewife purchase a well-made powered refrigerator followed by incredibly detailed instructions for how to go about using and maintaining it properly.
- 14 Only eight of the 56 firms making refrigerators in the United States in 1923 were properly financed or involved in mass production. See Penny Sparke, *Domestic Appliances* (London, 1987), p. 29.
- 15 T. A. Corley, *Domestic Electrical Appliances* (London, 1966), p. 14.

REFERENCES

- 16 Prestcold emerged from the Second World War as Britain's largest refrigerator manufacturer. See Pressed Steel Company, *24 Years of Progress: 1926–1950* (Oxford, 1950), p. 19.
- 17 Corley, *Domestic Electrical Appliances*, p. 30.
- 18 Alfred Mellows's Guardian was interesting in that it was the first self-contained version, with the compressor contained in a compartment at the bottom of the wooden-carcass machine.
- 19 Judith Howald, 'Historical Sketch', Frigidaire Historical Collection listing MS-262, www.libraries.wright.edu, 15 March 2015.
- 20 In fact the entire American output of domestic refrigerators in 1919 was only 5,000 machines. See Corley, *Domestic Electrical Appliances*, p. 107.
- 21 *Ibid.*, pp. 80–82. The same of course went for forming the bodies of most 'white good' appliances. See Sparke, *Electrical Appliances*, p. 28, for a longer discussion.
- 22 Corley, *Domestic Electrical Appliances*, pp. 80–81.
- 23 *Ibid.*
- 24 *Ibid.*, p. 82.
- 25 Ferdinand Carré's earlier machine provided the inspiration for their efforts to produce a silent method of refrigeration to use in the home. For a detailed description of how this machine operated see S. N. Sapail, *Refrigeration and Air Conditioning* (New Delhi, 2011), pp. 256–8.
- 26 The invention made its way into the February 1926 edition of *The Engineer*.
- 27 Sparke, *Electrical Appliances*, p. 34.
- 28 Alexander Stevenson, *Report on Domestic Refrigerating Machines*, p. 1. The historian Ruth Schwartz Cowan, recognizing the historical value of the General Electric report, was instrumental in getting this report digitized. See Appendix 21 for a description of the Audiffren machine.
- 29 *Ibid.*, p. 5.
- 30 The story of the commercial success of the resulting market-leading electrically powered Monitor Top over its gas absorption rivals in the United States has been well told already by Ruth Schwartz Cowan, 'How the Refrigerator Got Its Hum', in *The Social Shaping of Technology*, ed. Donald MacKensie and Judy Wajcman (Buckingham, 1985), pp. 202–18.

- 31 Steenstrup, originally a Danish immigrant, worked his way up from toolmaker at General Electric.
- 32 Eric. G. Rowledge, 'Project . . . Prototype . . . Production: The Resources behind the Product', in *Prestcold Times*, 1/4 (1949), p. 3, www.bl.uk. The article was written as an educational sales tool, aiming to inform and inspire sales representatives.
- 33 *Ibid.*, p. 5.
- 34 John Pollak, letter to the Science Museum, 2015. The refrigerator was donated to the Science Museum in 2015 after having run nonstop for sixty years. See John's fridge in his kitchen at www.oxfordtimes.co.uk.
- 35 Motor and compressor were sealed in together in part to reduce the risk of refrigerant leaking and making it a sealed unit, easier to maintain. It famously got its name from its resemblance to the gun turret of the American Civil War steamship *USS Monitor*. By the 1940s, most refrigerators were hermetically sealed.
- 36 Advertisement in *Nation's Business*, May 1932, but the phrase was used widely by General Electric to tout the benefits of their machine.
- 37 *Better Homes and Gardens*, 1 October 1930, p. 38.
- 38 General Electric, *Description and Operation of NEW GENERAL ELECTRIC Monitor Top, Flat Top and Combination Models, Salesman's Bulletin, No. 14* (Cleveland, OH, 1934).
- 39 Challenging the dominance of Frigidaire and Kelvinator up to that time.
- 40 Schwartz Cowan, 'How the Refrigerator Got its Hum', p. 210.
- 41 Germany, Sweden, France, Italy and Holland were faster to develop appliance industries than Britain. Sparke, *Electrical Appliances*, p. 26.
- 42 *Ibid.*, p. 38. Also Corley, *Domestic Electrical Appliances*, p. 19.
- 43 *Ibid.*, p. 11. Also Adrian Forty, *Objects of Desire: Design and Society Since 1750* (London, 1986), pp. 209, 213.
- 44 Until 1931 there was relatively little incentive for foreign firms to set up production in Britain, as there was no tariff on imported goods. With the abandoning of the gold standard the price of imported appliances soared, encouraging both foreign firms to produce in Britain and British firms to increase production. Corley, *Domestic Electrical Appliances*, p. 34.
- 45 Prestcold also applied the mass-production techniques and expertise developed for manufacturing car bodies to produce

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- refrigerators. Established in 1933, they also supplied industrial refrigeration to businesses further along the food chain: from supermarkets and restaurants to ice cream manufacturers. Their machinery was also used in the manufacture of penicillin by Glaxo Laboratories and at the Houses of Parliament. Pressed Steel Company, *24 Years of Progress*.
- 46 'Sur le train de Gennevilliers, le Frigidaire no. 1,000,000', *Paris Match*, October 1961.
- 47 By 1939 there were still only 300,000 refrigerators in use in Britain, with 40,000 gas and 20,000 electric refrigerators sold that year. The 20,000 electric refrigerators came from twenty companies with the average output of most very small. Corley, *Domestic Electrical Appliances*, p. 36.
- 48 Or for 'six pennies on easy terms'. Roberts, *Refrigeration and Air Conditioning*, p. 57.
- 49 Jan Boxshall, 'Good Housekeeping' *Every Home Should Have One: Seventy-five Years of Change in the Home* (London, 1997), p. 45.
- 50 Corley, *Domestic Electrical Appliances*, p. 15.
- 51 For example, one 1950s Hotpoint refrigerator advert highlighted the 'classic proportions' and 'coach-build quality' of the machine.
- 52 Lawrence C. Lockley, 'Marketing Mechanical Refrigerators During the Emergency', p. 249 in *Journal of Marketing*, vi/3 (January 1942), pp. 245–51.
- 53 EDA, *The House You Want* (London, 1929). Show kitchens in Britain did not widely feature refrigerators before the 1930s.
- 54 *Good Housekeeping* magazine, 1925, in Boxshall, *Every Home Should Have One*, p. 21.
- 55 See Judy Attfield, *Bringing Modernity Home: Writings on Popular Design and Material Culture* (Manchester, 2007), p. 151. The Council was founded by Hugh Dalton, then President of the Board of Trade in 1944.
- 56 Elizabeth Roberts, *A Woman's Place: An Oral History of Working-class Women, 1890–1940* (Oxford, 1984), p. 129.
- 57 Pressed Steel, 'New Model Heralds Decade', *Prestcold Post: Sales and Sales Promotion News: Feb 1960* (Oxford, 1960).
- 58 *Paris Match*, May 1969 and March 1957, www.50ansdepubs.com, accessed 14 March 2014.
- 59 'Starting from Scratch', *Good Housekeeping* magazine, 1955, reproduced in Boxshall, *Every Home Should Have One*, pp. 79–81.

- 60 Alan Cooper, *World Below Zero: A History of Refrigeration in the UK* (Aylesbury, 1997), p. 81.
- 61 Owen C. Pawsey, 'Selling Appliances through Kitchen Planning', *Electrical Trading*, April 1936, pp. 55–6. The author noted that America was ahead of the game in terms of developing a sales strategy in which individual electrical appliances were sold as part of a whole planned kitchen.
- 62 In France 'Frigidaire' became the more familiar colloquialism over the French 'Frigéavia'. Hubert Bonin and Ferry de Goey, *American Firms in Europe, 1880–1990: Strategy, Identity, Perception and Performance* (Geneva, 2009), p. 522. Opinions vary here as to whether 'fridge' – a shortened version of 'refrigerator' – derives from Frigidaire or from the Latin word *frigidarium*, for a cold room in the Roman baths.
- 63 Frigidaire advertisement, 1955.
- 64 *Paris Match*, www.50ansdepubs.com, March 1957.
- 65 *Paris Match*, www.50ansdepubs.com, February 1956. The names perhaps 'betray' the company's General Electric roots.
- 66 'Frigéco ouvre-toi!', *Paris Match*, www.50ansdepubs.com, March 1960.
- 67 'The Sheer Look. The Crowning Touch by Frigidaire', 1957, General Motors, GA-4593.
- 68 'Imperial' advert for Frigidaire's 'Sheer Look', 1957, www.youtube.com, February 2015. The new range of appliances was standardized in size for that 'made for my kitchen' look.
- 69 Advert for the Prestcold 'Colour-choice' D.361 refrigerator. 'It's the Prestcold New-as-tomorrow Colour-choice Refrigerator', brochure by the Pressed Steel Company Limited, c. 1956.
- 70 Elizabeth Roberts, *Women and Families: An Oral History, 1940–1970* (Oxford, 1995), pp. 223–4, 216–18.
- 71 Mika Pantzar, 'Tools or Toys: Inventing the Need for Domestic Appliances in Postwar and Postmodern Finland', *Journal of Advertising*, xxxii/1 (2003), pp. 83–93. Once an appliance becomes accepted as a necessity there is no longer a need for a public discussion about that need and debate moves to the 'everyday practice' arena, p. 91.

4 REFRIGERATOR DREAMS

- 1 Ethel Peyser, 'Keep it Cool in a Good Refrigerator', *House and Garden* magazine (May 1919), p. 52; reprinted in Peyser, *Cheating*

REFERENCES

- the Junk-pile: The Purchase and Maintenance of Household Equipments* (New York, 1919), p. 289.
- 2 In the case of two-part machines, the cooling mechanism and the insulated icebox parts were located separately due to noise concerns and space constraints.
 - 3 Alexander Stevenson, *Report on Domestic Refrigerating Machines, 1923–1925* (Schenectady, NY, 1923, with additions in 1924 and 25), p. 352, www.ashrae.org, accessed 16 March 2016. At that time Audiffren machines had been running the longest of all available models, with little certainty that any domestic refrigerator would last even ten years in operation.
 - 4 E. A. Sampson, 'Preserving Food in 7,000,000 Homes', *The DuPont Magazine* (Midsummer 1936), p. 13.
 - 5 Partly dictated by manufacturing prerogative and the need to house a condenser unit, but resisting a growing pressure to standardize the dimensions of kitchen units in general.
 - 6 Another notable appliance designer in the early twentieth century but not discussed here is Brook Stevens. See Glenn Adamson, ed., *Industrial Strength Design: How Brook Stevens Shaped Your World* (Cambridge, MA, 2003).
 - 7 Penny Sparke, *Domestic Appliances* (London, 1987), p. 53.
 - 8 *Ibid.*, pp. 53, 79. Also 'Coldspot: 1928–1976', www.searsarchives.com, accessed 26 May 2016.
 - 9 At www.raymond-loewy.com, accessed 27 July 2016.
 - 10 Sampson, 'Preserving Food in 7,000,000 Homes', p. 13.
 - 11 Sears Roebuck advert for the Coldspot 'super Six' in 1935, reproduced in Jonathan Woodham, *Twentieth-century Design* (Oxford, 1997), p. 69.
 - 12 Elizabeth Roberts, *Women and Families: An Oral History, 1940–1970* (Oxford, 1995), p. 25.
 - 13 See www.massobs.org.uk to find out more about the organization and its archives, accessed 9 April 2016.
 - 14 Mass Observation, 'A Report on "Britain Can Make It" Exhibition, Section C', 1946, p. 35, quoted in Ben Highmore, *The Great Indoors: At Home in the Modern British House* (London, 2014), p. 88. Highmore uses the Mass Observation archives to great effect to explore contemporary thought about the domestic environment.
 - 15 Peter Ward, *A History of Domestic Space* (Vancouver, 1999), p. 4.

- 16 Raymond Patten, exhibit designer for General Electric, quoted in Sparke, *Domestic Appliances*, p. 53.
- 17 The most famous example of this is the Frankfurt kitchen, designed by Margaret Schütte-Lihotzky, Austria's first female architect, in 1926. The kitchen was designed for the use of one adult at a time. Given the date, it did not incorporate a refrigerator or allow space for one to be retro-fitted.
- 18 In an age in which planners considered hygiene of utmost importance, some architects and health inspectors regarded larger open-plan combined kitchen/living areas as unhygienic. See Tim Benton, *The Modernist Home* (London, 2006), p. 74.
- 19 See Janice Williams Rutherford, *Selling Mrs Consumer: Christine Frederick and the Rise of Household Efficiency* (Athens, GA, 2003).
- 20 T. A. Corley, *Domestic Electrical Appliances* (London, 1966), p. 22. Kitchenettes became popular in part as a response to smaller household size and also owing to the increasing amount of canned convenience foodstuffs available, together with the common practice of outsourcing laundry work at this time.
- 21 Adrian E. Powell, 'The Domestic Uses of Electricity', *Journal of the Royal Institute of British Architects* (23 November 1935), p. 88. The EAW's show house had a small 2-cubic-foot Electrolux refrigerator fitted.
- 22 Greg Stevenson, *The 1930s Home* (Princes Risborough, 2005), p. 30.
- 23 U.S. Bureau of Home Economics advert, U.S. Department of Agriculture, National Agricultural Library (1942), www.nal.gov, 11 January 2015.
- 24 Mass Observation, *People's Homes*, April 1943, p. 327.
- 25 Jan Boxshall, 'Good Housekeeping' *Every Home Should Have One: Seventy-five Years of Change in the Home* (London, 1997), p. 76; P. Gansky, 'Refrigerator Design and Masculinity in Postwar Media, 1946–1960', *Studies in Popular Culture*, xxxiv/1 (2011), p. 69.
- 26 Interview with Dorothy Capper, Freda Davies, Doreen Jeeves and Mavis Workman by John Hollings, 2004, 'Conversation in Hallow about Accent, Dialect and Attitudes to Language', BBC Voices Project, reference C1190/15/02, The British Library. The 'slab' mentioned was probably made of marble to keep produce cold. Refrigerators are mentioned at around 37 minutes.
- 27 Mass Observation, *People's Homes*, April 1943, pp. 324–5.
- 28 *Ibid.*, p. 327.

REFERENCES

- 29 Smaller ones were only expected to store small amounts of milk, meat and fish. The Good Housekeeping Institute, *The Book of Good Housekeeping* (London, 1946), p. 114. It was first issued in 1944 and reprinted due to popular demand.
- 30 Interview with Raymond Bird by Thomas Lean, 2010, 'An Oral History of British Science', British Library Sound and Moving Image Catalogue reference C1379/04, The British Library.
- 31 Ibid. His mother also purchased an American 'kitchen' – basically a kitchen cabinet with spaces for various ingredients and utensils – in keeping with notions of a laboratory kitchen.
- 32 Four female designers and architects designed the house. E. Darling, 'The House that is a Woman's Book Come True: The All-Europe House and Four Women's Spatial Practices in Inter-war England', in *Women and the Making of Built Space in England, 1870–1950*, ed. Elizabeth Darling and Lesley Whitworth (Aldershot, 2007), pp. 123–35.
- 33 Modern house planning books such as Terence Conran's updated classic *The Ultimate House Book* (London, 2003) and Naomi Cleaver's *The Joy of Home* (London, 2010) still refer to the kitchen, or work, triangle as a useful kitchen-planning device.
- 34 Lord Woolton quoted in the EDA's 'Electric Kitchen Plans for Low Cost Post War Housing', February 1944. The EDA, of course, had a view that all-electric kitchens would predominate. Their plans were drawn up in consultation with architects and planners with a view to influence housing authorities and 'those responsible for the design of post-war homes', p. 1.
- 35 The classic work here is Ruth Schwarz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York, 1983). Also see Adrian Forty, *Objects of Desire: Design and Society since 1750* (London, 1986).
- 36 Reminiscence of Mrs Morrison, from Lancashire, in Elizabeth Roberts, *Women and Families: An Oral History, 1940–1970* (Oxford, 1995), p. 30.
- 37 Alongside this, of course, more and more women were in paid employment outside of the home.
- 38 Quoted in Roberts, *Women and Families*, p. 30.
- 39 Quoted in Sally Waller, *A Sixties Social Revolution? British Society, 1959–1975* (Oxford, 2008), p. 85.

- 40 Good Housekeeping Institute, *The Book of Good Housekeeping*, p. 105.
- 41 Ibid, plates XII to XIV, facing p. 112.
- 42 Nicole C. Rudolph, *At Home in Postwar France: Modern Mass Housing and the Right to Comfort* (Oxford, 2015), pp. 33–5.
- 43 Prestcold advertisement in *Good Housekeeping*, 1949, reproduced in Boxshall, *Every Home Should Have One*, p. 64.
- 44 J. Saunders Redding, writing in the *Baltimore Afro-American* in 1946. Quoted in Cynthia Lee Henthorn, *From Submarines to Suburbs: Selling a Better America, 1939–1959* (Athens, OH, 2006), p. 201.
- 45 The 156,000 prefabs built were only a small percentage of the total 1.2 million new homes built in the UK between 1945 and 1951. Prefab homes and their amenities were warmly welcomed as part of the response to homelessness and squalid housing conditions made worse by the war.
- 46 The Arcon model was designed and manufactured by Taylor Woodrow. AIROH stands for Aircraft Industries Research Organisation on Housing. See Arcon, ‘The Design, Organisation and Production of a Prefabricated House’, in *Building* (March–June 1948), pp. 4, 11.
- 47 Oral testimony of Nellie Rigby, who moved into a prefab in Belle Vale, a suburb of Liverpool, in 1946, at <https://voicesofpostwarengland.wordpress.com>, accessed 14 March 2015.
- 48 Martin Pawley, ‘The Rise and Fall of Public Sector Housing’, *Frieze*, www.frieze.com, May 1993.
- 49 For a discussion of the role of prefabs in popularizing consumer white goods in the 1940s and ’50s see Helen Watkins, ‘Fridge Space: Journeys of the Domestic Refrigerator’, PhD thesis, University of Columbia, New York (2008), p. 158, at www.open.library.ubc.ca.
- 50 Jane D., recounted to the author, 2015.
- 51 Gansky, ‘Refrigerator Design and Masculinity’, p. 70.
- 52 An advert with the Archer family endorsing the Coldrator appeared, for example, in *Ideal Home* magazine in 1955.
- 53 Judy Attfield, *Bringing Modernity Home: Writings on Popular Design and Material Culture* (Manchester, 2007), p. 161.
- 54 Le Roy Staunton, ‘Selling the Home Owner on his Home’, *DuPont Magazine* (October 1929), p. 14.
- 55 *Prestcold Post*, July 1960.

REFERENCES

- 56 Jan Boxshall, *Every Home Should Have One*, p. 76.
- 57 *The Economist*, 26 December 1959, p. 1220.
- 58 Hugh Gaitskill, 'Understanding the Electorate', *Socialist Commentary*, July 1955, quoted in David Kynaston, *Family Britain: 1951–1957* (London, 2009), p. 480.
- 59 Dominic Sandbrook, *White Heat: A History of Britain in the Swinging Sixties, 1974–1970* (London, 2006), p. 691.
- 60 Taylor Woodrow, 1956. Also quoted in Kynaston, *Family Britain*, p. 666.
- 61 'Homes for Today and Tomorrow', Parker Morris Report, 1961, London: Ministry of Housing & Local Government, HMSO; Tara Garnett and Tim Jackson, 'Frost Bitten: An Exploration of Refrigeration Dependence in the UK Food Chain and its Implications for Climate Policy', paper presented to the 11th European Round Table on Sustainable Consumption and Production, Basel (2007), p. 14.
- 62 'Starting from Scratch', *Good Housekeeping* (1955), reproduced in Boxshall, *Every Home Should Have One*, pp. 79–81.
- 63 See Robert P. Miller, 'Modernising the Kitchen', *DuPont Magazine* (July–August 1940), pp. 8–9, which describes the use of a kitchen-planning scale model.
- 64 Kelvinator advert, 1950s, Hagley archives.
- 65 Michael Dunlop Young and Peter Willmott, *Family and Kinship in East London* [1957] (London, 1986), p. 126. In the 1930s there were still on average three households for every two dwellings in the UK. This had reduced slightly to five households for every four dwellings by 1951.
- 66 *Ibid.*, p. 52.
- 67 On 14 July 1954 Britain's Board of Trade removed the restrictions on hire purchase agreements for a raft of consumer goods including refrigerators, radios and motor cars.
- 68 'Introducing the Cannonlux', Cannon Ltd Company brochure, n.d.
- 69 The Packaway was the first winner of the Design Council's (then the Council of Industrial Design) Duke of Edinburgh's Prize for Elegant Design. See Elizabeth Shove and Dale Southerton, 'Defrosting the Freezer: From Novelty to Convenience: A Narrative of Normalization', *Journal of Material Culture*, v/3, (2000), p. 309, on the effect of fitted kitchens on refrigerator design in America, 'forcing fridges to square up and squash down below the 700 mm threshold of the standard work top'.

- 70 John Blake, 'Shop Test', in the *Daily Express*, January 1960.
Blake was also the editor of the Council of Industrial Design's *Design* magazine.
- 71 *Prestcold Post*, February 1960.
- 72 Corley, *Domestic Electrical Appliances*, pp. 114–15.
- 73 Article in 1980s *Good Housekeeping* magazine: 'Kitchens Coping in a Mean Cuisine'. See Boxshall, *Every Home Should Have One*, p. 112.
- 74 Related to author, February 2015.
- 75 Monica Dickens, *One Pair of Hands* [1939] (London, 2011), pp. 50–51.
- 76 Bruce Lacey remembering the actions of an inventive neighbour. Interview with Bruce Lacey by Gillian Whiteley, 2000, Oral History Collection, British Library Sound & Moving Image Catalogue reference C466/99, The British Library.
- 77 *Prestcold Post*, July 1961.
- 78 Gansky talks about the generally uneasy and passive relationship men had with refrigerators in mid-twentieth-century America, where these machines were often seen as 'effectively subverting household patriarchs': 'Refrigerator Design and Masculinity', p. 77.
- 79 At www.powerful.yt, accessed May 2015.
- 80 Richard Hoffman, 'Refrigerator', *Harvard Review*, 27 (2004), p. 138.
- 81 John LaRue, 'The 10 Most Memorable Movie Refrigerators', www.tdylf.com, September 2012.
- 82 Michael Shea, 'User-friendly: Anthropomorphic Devices and Mechanical Behaviour in Japan', *Advances in Anthropology*, 1V/1 (2014), pp. 41–9.
- 83 Akiko Busch, 'Refrigerator', in *The Uncommon Life of Common Objects: Essays on Design and the Everyday* (New York, 2005), p. 101.
- 84 Edwin Heathcote, *The Meaning of Home* (London, 2012), p. 56.
- 85 Sanjoy Majumder, 'The First Fridge for a Family and Whole Village', www.bbc.co.uk, 28 January 2015.

5 ANATOMY OF THE REFRIGERATOR

- 1 The General Electric Monitor Top is a good case in point. See Chapter Three.
- 2 Shelley Nickles, 'Preserving Women: Refrigerator Design as Social Process in the 1930s', *Technology and Culture*, XLIII/4 (2002), pp. 693–727.

REFERENCES

- 3 Powel Crosley Jr was an inventor himself.
- 4 Notable industrial designer Walter Dorwin Teague helped with the design of the shelves. See Carroll Gantz, *Refrigeration: A History* (Jefferson, NC, 2015), p. 157.
- 5 The Crosley Corporation story is entertainingly told in Rusty McClure, David Stern and Michael A. Banks, *Crosley: Two Brothers and a Business Empire That Transformed a Nation* (Cincinnati, OH, 2006). See especially Chapter 21.
- 6 *Popular Mechanics*, June 1934, p. 118.
- 7 *Life*, 24 September 1945, p. 83. You can see Shelvador adverts, among others, on the YouTube channel ClassicCommercialTV.
- 8 *Life*, 23 April 1956, pp. 40–41; and 30 May 1960, p. 1.
- 9 Nickles, 'Preserving Women', p. 693.
- 10 See for example Margaret Nava, *Hummingbird Ridge* (Smyrna, GA, 2009), p. 10.
- 11 See '1948 GE Revolving Shelf Refrigerator', www.thegadgetpage.com, accessed May 2015.
- 12 Gantz, *Refrigeration*, p. 193.
- 13 See two designs here: 'Window Refrigerator: See What's Inside Without Open [sic] Your Fridge', www.tuvie.com, and 'The C-fridge: Designed to Save on Energy Usage', www.igreenspot.com, both accessed 3 August 2016.
- 14 National Energy Saving Campaign for the Government of South Africa's Eskom, www.youtube.com. Made for Eskom with the strapline 'Make Every Watt Count'.
- 15 Unlike early commercial machines which made a point of displaying the back-end machinery. See Chapter Two.
- 16 Hiding away the beating heart of the refrigerator also transpired as a logical extension of the adoption of mass production methods. See Chapter Three.
- 17 See E. A. Sampson, 'Preserving Food in 7,000,000 Homes', in *DuPont Magazine* (Midsummer 1936), p. 11, www.digital.hagley.org, accessed May 2014. DuPont used Duco paint finish on refrigerators in the late 1920s. Three and a half thousand Authorised Duco Refinishing and Service Stations were instructed in the use of Duco for refrigerators. See R. C. Peter, 'Duco: A Contribution to the Household Refrigerator', in *DuPont Magazine* (May 1929), p. 18. Duco paint was used for many domestic appliances, among many other applications.

- 18 It was eventually available in a seasonally changing variety of colours. See Chapter Three for a more detailed discussion of refrigerator colour.
- 19 Sampson, 'Preserving Food', p. 14.
- 20 E. A. Sampson, 'From Ice Chests to Iced Refrigerators', *DuPont Magazine*, September 1936, p. 14.
- 21 Made from polythene, Tupperware's useful properties make it ideal for the fridge: hygienic, easy to clean, shatterproof, sealable and good at protecting food from absorbing other smells. One of Pyrex's biggest advantages, and one which advertisers were quick to focus on, was its flexibility. 'Oven, refrigerator and freezer' sets were developed especially for the home so that dishes could go straight from fridge or freezer, to oven and then table. Both Tupperware and Pyrex brought out product ranges especially for the fridge.
- 22 Until the 1950s many refrigerator adverts showed shelves stocked with unwrapped foodstuffs. Partly this was to make the interior look attractive in adverts, and to show housewives an aspirational lifestyle of plenty, but it also reflected the fact that better products for storing food inside had yet to be invented or considered necessary to use.
- 23 *Paris Match*, May 1957, www.50ansdepubs.com, accessed May 2014.
- 24 See Helen Watkins, 'Fridge Space: Journeys of the Domestic Refrigerator', PhD thesis, University of Columbia, New York (2008), www.open.library.ubc.ca, pp. 96–7.
- 25 *The Day* newspaper, 18 July 1974, p. 23. As the Frigidaire salesman commented: 'The trick is to come up with something that makes a contribution to the household.'
- 26 See Chapter Three for a discussion of General Electric's entry into the refrigerator industry.
- 27 Alexander Stevenson, *Report on Domestic Refrigerating Machines, 1923–1925* (General Electric, Schenectady, 1923, with additions in 1924 and 25), www.ashrae.org, accessed 16 March 2016, p. 45.
- 28 General Electric, 'Answering Your Questions about Electric Refrigeration', 1929, quoted in Jonathan Rees, *Refrigeration Nation* (Baltimore, MD, 2013), p. 155; and Alexander Stevenson, *Report on Domestic Refrigerating Machines*, p. 382.
- 29 General Electric Infobase, www.geappliances.com, accessed 14 May 2015.

REFERENCES

- 30 Hasan Koruk and Ahmet Arisoy, 'Identification of Crack Noises in Household Refrigerators', *Applied Acoustics*, LXXXIX (March 2015), pp. 234–43.

6 A CULINARY REVOLUTION

- 1 'Larder' derives from the French word *lardier*, which was used for a place for storing salted meats. Edwin Heathcote, *The Meaning of Home* (London, 2012), p. 58.
- 2 See David Kynaston, *Family Britain: 1951–1957* (London, 2009), p. 676.
- 3 See Tara Garnett and Tim Jackson, 'Frost Bitten: An Exploration of Refrigeration Dependence in the UK Food Chain and its Implications for Climate Policy', paper presented to the 11th European Round Table on Sustainable Consumption and Production, Basel (2007), p. 10.
- 4 The first commercial shipment of bananas arrived into Avonmouth in 1901 and by 1926 six and a half million stems of bananas arrived at this port alone. They were transported from there across the country and the continent. R. M. Parsons, 'Elders & Fyffes: A Short History of the Company and its Famous Banana Boats', *Ships Monthly*, April 1988, Part 1: 1901–1940, pp. 20 and 24; and N. Wijnlst and Tor Wergeland, *Shipping Innovation* (Amsterdam, 2009), p. 288. Today, over five million tons are consumed annually in Europe alone.
- 5 The Good Housekeeping Institute, *The Book of Good Housekeeping* [1944] (London, 1946), caption, facing p. 97.
- 6 Sandy Isenstadt explores the imagery of refrigerator advertising in America in 'Visions of Plenty: Refrigerators in America around 1950', *Journal of Design History*, XI/4 (1998), pp. 311–21, abstract.
- 7 Jonathan Rees, *Refrigeration Nation* (Baltimore, MD, 2013), p. 2.
- 8 Bee Wilson, *Consider the Fork: A History of How We Cook and Eat* (London, 2012), p. 270.
- 9 Electricity Council of England and Wales advert in *Good Housekeeping*. Reprinted in Jan Boxshall, 'Good Housekeeping' *Every Home Should Have One: Seventy-five Years of Change in the Home* (London, 1997), p. 100.
- 10 F. W. Salisbury, 'The Shop and its Equipment', *JS Journal*, 1/4 (1947), <https://jsjournals.websds.net>, p. 14.
- 11 Kynaston, *Family Britain*, p. 676.

- 12 Interview with Robert (Bob) Dixon by Louise Brodie, 1999, 'Food: From Source to Salespoint', British Library Sound and Moving Image Catalogue reference C821/22/02, The British Library.
- 13 Howard Cox, Simon Mowatt and Martha Prevezer, *From Frozen Fishfingers to Chilled Chicken Tikka: Organisational Responses to Technical Change in the Late Twentieth Century* (London, 1999).
- 14 Kynaston, *Family Britain*, p. 669.
- 15 Elizabeth Roberts, *Women and Families: An Oral History, 1940–1970* (Oxford, 1995), p. 42.
- 16 Mass Observation, *People's Homes*, April 1943, p. 323.
- 17 Lesley Garner, 'A Day in the Life of a Not-so-good Housekeeper', originally in *Good Housekeeping* magazine in 1979; reprinted in Boxshall, *Every Home Should Have One*, pp. 106–7.
- 18 Katie Hope, 'The Death of the Weekly Supermarket Shop', www.bbc.co.uk, 5 October 2014.
- 19 Most surveys show that the amount of food waste thrown away, be it from the home, supermarkets or wholesalers, has rocketed in the UK in recent years. For example, a survey conducted by the supermarket Tesco in 2013 found that over two-thirds of the salad they sold in bags was thrown away by store or customer, while 40 per cent of apples and just under half of its baked goods went the same way.
- 20 Rose Prince, *Kitchenella: The Secrets of Women: Heroic, Simple, Nurturing Cookery – For Everyone* (London, 2010), p. 35.
- 21 Tassos Stassopoulos, 'Richer World: The Predictive Powers of Fridges', www.bbc.co.uk, 27 March 2015.
- 22 Ibid.
- 23 'Fridgeonomics: What My Fridge Means to Me, Nairobi', www.bbc.co.uk, 30 January 2015.
- 24 Stassopoulos, 'Richer World'.
- 25 Luce Giard, 'Doing-cooking', in Michel de Certeau, Luce Giard and Pierre Mayol, *The Practice of Everyday Life*, vol. II: *Living and Cooking*, trans. Timothy J. Tomasik, (London, 1998), especially pp. 204–13.
- 26 'Is Your Fridge All Wrong? The Secrets of Food Organisation', *The Telegraph*, 16 January 2015.
- 27 Pressed Steel Company Limited, *Prestcold Catering* (Oxford, 1959), p. 1.
- 28 Elizabeth Craig, *The Way to a Good Table: Electric Cookery* (BEDA) (London, 1937), p. 12.

REFERENCES

- 29 Lizzie Collingham, *The Taste of War: World War Two and the Battle for Food* (London, 2011).
- 30 Perhaps taking some precedence from earlier seventeenth- and eighteenth-century ‘receipt’ or recipe books, which were as likely to contain more alchemical and chemical recipes as culinary ones.
- 31 Electrical Development Association, *The Art of Cold Cookery: The Electric Domestic Refrigerator and Home Freezer Handbook* (London, 1960), p. 16.
- 32 Quoted in Kynaston, *Family Britain*, p. 399.
- 33 Search for old manuals or cookbooks, or more broadly adverts or articles touting ‘cold cookery’ or ‘cold cuisine’.
- 34 According to Escoffier, one-time chef at the Savoy Hotel, London: ‘Jellies are to cold cookery what consommés and stock are to hot.’ Jelly was served in a ‘state of absolute perfection’ in his recipe for Suprême de Volaille Jeannette. Auguste Escoffier, Philéas Gilbert, E. Fétu, A. Suzanne, B. Reboul, Ch. Dietrich, A. Caillat et al, *Le Guide Culinaire: Aide-mémoire de cuisine pratique* (Paris, 1903), p. 59.
- 35 *Courier-Mail*, Brisbane, 12 October 1936, p. 20. Another article on the same page also implicitly links the preservation of ‘healthful food’ in refrigerators to cold cookery. The 1934 *Sarasota Herald Tribune* article reference to ‘cold cookery’ is so far the earliest one I have found which uses it in relation to powered refrigerators.
- 36 Four years later and the *Electrical Journal* was talking in more diffident fashion about ‘this “cold cookery idea”’ as something which may yet be ‘adopted or discarded’ by the electrical industry. *Electrical Journal*, 121 (1938), p. 254.
- 37 Charles Hope Ltd, *Instructions for the Installation, Operation and Maintenance of the Charles Hope Cold Flame Refrigerator . . . with Recipes* (place and date unknown, although the booklet dates from the 1940s or 1950s, with Charles Hope refrigerators themselves manufactured in Brisbane, Australia).
- 38 AEG, *Kalte Küche. Rezepte, Anregungen und Winke zur Bereitung von Erfrischungen, kühlen Speisen und Getränken im AEG-Kühlschrank* (Frankfurt, 1956). This version featured a fine silver cover with a picture of a desert in shadow relief.
- 39 Alice Bradley, *Electric Refrigerator Recipes and Menus Specially Prepared for the General Electric Refrigerator* (Cleveland, OH, 1927). Published alongside the newly launched General Electric

'Monitor Top' electric refrigerator. Bradley was Principal of the famed Fannie Farmer's school – Miss Farmer's School of Cookery – which had earlier issued the popular *Boston Cookbook* in 1896 covering the use of iceboxes.

- 40 Ibid., Foreword, p. 7.
- 41 Other refrigerator cookbooks which reveal similar trends, if in less explicit form, include *Frozen Desserts and Salads Made in Frigidaire* (1926), *Frozen Delights* (1927) and *Servel Coldery* (1926).
- 42 GEC, *Artistry in Cold Food Preparation* (London, 1954).
- 43 De Certeau, Giard and Mayol, *The Practice of Everyday Life*, p. 221.
- 44 General Electric, *The 'Silent Hostess' Treasure Book* (Cleveland, OH, 1931), pp. 20–21, 27.
- 45 Most households in the early twentieth century would have only owned a couple of cookbooks.
- 46 See www.cooksinfo.com/marguerite-patten.
- 47 Patten had plenty of experience of cooking with modern appliances, with previous jobs including work as a home economist at the Eastern Electricity Board, and later for Frigidaire. The first product of the meeting between Hamlyn and Patten was the classic *Cookery in Colour* (1960) – innovative in its day, as every second page was printed on different coloured paper. By 2006 Patten had sold more than seventeen million copies of her cookbooks.
- 48 Marguerite Patten, *500 Recipes for Refrigerator Dishes* (London, 1960), inside of front cover.
- 49 Nicola Humble, *Culinary Pleasures: Cookbooks and the Transformation of British Food* (London, 2005). Humble stressed the importance of cookbooks in telling us about the 'hopes and fears, the tastes and aspirations, the fantasies and paranoias, and the changing social roles of its particular historical moment', p. 2.
- 50 *Frigidaire's Frozen Delights* (Daytoon, OH, 1927).
- 51 Roland Barthes, 'Ornamental Cookery', in *Mythologies*, trans. Annette Lavers (New York, 1991), pp. 78–80.
- 52 Ibid., p. 79. Also see Jessamyn Neuhaus, 'The Way to a Man's Heart: Gender Roles, Domestic Ideology, and Cookbooks in the 1950s', *Journal of Social History*, xxxii/3 (1999), pp. 529–55.
- 53 'Fresh' is an interestingly vague and hard-to-define quality in foodstuffs. See Susanne Freidberg, *Fresh: A Perishable History* (Cambridge, MA, 2010).

REFERENCES

- 54 Perhaps inspired by those who had originally seen it made in a spectacular demonstration at the Science Museum years before.

7 'IS THERE HEALTH IN YOUR REFRIGERATOR?'

- 1 Marguerite Patten, www.theguardian.com, 14 October 2007, accessed 15 May 2015.
- 2 Adrian Forty, *Objects of Desire: Design and Society since 1750* (London, 1986), p. 156. Forty's classic of design history includes a complete chapter on design, hygiene and notions of dirt in the late nineteenth and early twentieth centuries.
- 3 Leonard advert, *Ladies' Home Journal* (May 1929), p. 254. Their traditionally styled icebox refrigerators were cooled by ice, gas or electricity.
- 4 McCray icebox refrigerator advertisement, late nineteenth century. One early twentieth-century test of the dryness of a refrigerator was to try striking a match on its walls.
- 5 The Seeger Dry Air Ice box still on display in the Science Museum likewise boasts a one-piece porcelain lining.
- 6 Ethel Peyser, *Cheating the Junk-pile: The Purchase and Maintenance of Household Equipments* (New York, 1922), pp. 107–8.
- 7 See Mary Douglas, *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo* (London, 1966).
- 8 Francis Bacon was coincidentally one of the earliest experimenters with freezing mixes and research into cooling. See Chapter One.
- 9 See for example Rosie Cox, 'Dishing the Dirt: Dirt in the Home', in Cox et al., *Dirt: The Filthy Reality of Everyday Life* (London, 2011), pp. 37–74.
- 10 Forty, *Objects of Desire*, p. 159. Nineteenth-century public health reforms in Britain were prompted by outbreaks of cholera and typhoid and more focused concern with the sanitary state of rapidly growing cities.
- 11 Culminating in the Food and Drugs (Adulterations) Act 1928. See Michael French and Jim Phillips, 'Assessing Food Additives: Regulating Chemical Preservatives, 1888–1938', in *Cheated Not Poisoned? Food Regulation in the United Kingdom, 1875–1938* (Manchester, 2009), pp. 96–123.
- 12 James Fenton, 'Report of the Medical Officer of Health for Kensington', p. 45. Available at <http://wellcomelibrary.org>.

American butchers in the early twentieth century peddled rotten meat, which was painted with preservative (a mix of boric acid, cochineal beetle and salt) to make it look fresh.

- 13 Anthony S. Wohl, *Endangered Lives: Public Health in Victorian Britain* (Cambridge, MA, 1983), pp. 52–3.
- 14 L. C. Auldjo, 'Mechanical Refrigeration, with Details of an Ammonia Compression Machine, and Description of Various Methods of Refrigeration', *Minutes of Proceedings of the Engineering Association of New South Wales* (May 1895), vol. x, p. 69.
- 15 What also ratcheted up the tension was severe competition between rival manufacturers peddling machines that ran on rivaling power sources. At first, manufacturers of powered gas and electric machines sought to differentiate their machines from iceboxes; then gas and electric sought to differentiate their machines from each other, both claiming particular health and hygiene benefits.
- 16 Caroline Haslett, ed., *The Electrical Handbook for Women* (London, 1934), p. 311.
- 17 Alice Bradley, *Electric Refrigerator Recipes and Menus Specially Prepared for the General Electric Refrigerator* (Cleveland, OH, 1927), p. 123.
- 18 Unsurprisingly, the idea of what this 'safe' temperature should be has changed over time. The Monitor Top kept food below the (then) accepted 'danger line' temperature of 50°F. Today, the advice is to keep your refrigerator at between 3°C and 4°C (37 and 40°F). Also unlike a domestic refrigerator, an icebox cannot turn itself off and on to help regulate the internal temperature.
- 19 Electrical Development Association, *The Art of Cold Cookery: The Electric Domestic Refrigerator and Home Freezer Handbook* (London, 1960), p. 10. The handbook was reprinted many times between the 1930s and 1960s.
- 20 *Courier-Mail*, Brisbane, 12 October 1936.
- 21 The subtext message being given is that purchasing *this* machine shows that you care about your family's health and well-being.
- 22 'Sanitary Inspectors', *Prestcold Times* (Oxford, 1950), p. 26. In New Zealand 'the impurity of perishable foods is unthinkable', with refrigerator ownership a necessity.
- 23 The *Prestcold Post* was distributed to company salesmen and usually displayed to consumers in their salesrooms.
- 24 *The Decorator and Furnisher*, IV/2 (May 1884), p. 62.

REFERENCES

- 25 Ibid.
- 26 Isabella Beeton, *The Book of Household Management* (London, 1907).
- 27 Auldjo, 'Mechanical Refrigeration', p. 68.
- 28 See 'What's Going Off in Your Fridge?', www.theguardian.com, 21 October 2013.
- 29 For an intriguing and lyrical read on refrigerator deaths see B. J. Hollars, 'Death by Refrigerator', *The Normal School*, www.thenormalschool.com, 14 May 2015.
- 30 The Refrigerator Safety Act was passed in 1956. Under this legislation all new refrigerators produced from 1958 onwards had to have doors that you could open from the inside with a minimum of 15 pounds of force. You can read the act at www.cpsc.gov, accessed March 2015.
- 31 Although rare, deaths still happen. In 2010 three Sudanese men froze to death having paid to sit inside a large refrigerated 'cool down facility' to temporarily escape the extreme summer heat.
- 32 You can still find this on YouTube today! American public service announcements also exist, including featuring the popular GI Joe cartoon character.
- 33 Today Freon is known as 'Freon 12' and 'R12'. Poor Thomas Midgely is also known for inventing leaded petrol, provoking one historian to declare that Midgely had 'more impact on the atmosphere than any other single organism in Earth's history.' See J. R. McNeill, *Something New Under the Sun: An Environmental History of the Twentieth-century World* (New York, 2001).
- 34 P. D. Smith, *Doomsday Men: The Real Dr Strangelove and the Dream of the Superweapon* (New York, 2007), pp. 172–3.
- 35 Midgely retrospectively received the dubious honour of being titled the first geo-engineer for inventing substances that had such unimaginable global environmental consequences.
- 36 J. E. Lovelock, R. J. Maggs and R.J. Wade, 'Halogenated Hydrocarbons in and over the Atlantic', *Nature*, CCXLI (1973), pp. 194–6.
- 37 According to Science Museum curator Alex Johnson.
- 38 It was left to the scientists Sherwood Rowland and Mario Molina to realize that these CFCs were breaking down in the upper atmosphere and deleting ozone. It earned them the 1995 Nobel Prize for Chemistry.

- 39 *Ethical Consumer* (January–February 2015), p. 24. While European regulations are now curbing HFCS, elsewhere they are still widely used.

8 REFRIGERATED WORLD

- 1 Ted Martin, 'Evolution of Ice Rinks', *ASHRAE Journal*, XLVI/11 (November 2004), Special Section, pp. 24–30.
- 2 National Exhibition of Economic Achievements (VDNKh) in November 2014
- 3 Merriam-Webster Online Dictionary, accessed April 2015.
- 4 Libby Purvis on BBC Radio 4's *Pilot*, www.bbc.co.uk, accessed November 2014.
- 5 This compares to Carré's late nineteenth-century *Frigorifique*, for example, which was 64 metres (210 feet) long and had only one refrigerated hold around 12 metres (39 feet) long. See Chapter Two.
- 6 *Yakh-chal* translates into English as 'ice pit'. Iranians today call their modern fridges and freezers Yakhchāl. These sophisticated systems had large thick-walled domes (up to 2 metres (7 feet) thick) above ground and burrowed deep storage below. Melting cooled water keeps the ice frozen and it is collected in trenches so that it can freeze during the night.
- 7 See Alan Guth, *The Inflationary Universe: The Quest for a New Theory of Cosmic Origin* (London, 1997).
- 8 Joseph E. Stevens, *Hoover Dam: An American Adventure* (Norman, OK, 1988), p. 193.
- 9 The coldest naturally occurring temperature in the universe is found in deep space at around 1K (or minus 272.15°C; minus 457.87°F). Background radiation left over from the Big Bang keeps it above absolute zero.
- 10 The LHC also created the hottest ever man-made temperature – the collision of iron atoms resulting in a temperature of almost 5.5 trillion Kelvin (just under 10 trillion °F).
- 11 Heat cannot be lost by convection in a vacuum, making efficient cooling by thermal radiation vital.
- 12 Charles Arthur, 'Internet Fridges: The Zombie Idea That Will Never, Ever Happen', www.theguardian.com, 7 January 2014.
- 13 'Presenting the 1955 Frigidaire Kitchen of Tomorrow', promotional video, www.youtube.com, accessed May 2015.

REFERENCES

- 14 The message for the bride to be is that such cutting-edge technologies will leave her 'free to have fun around the clock'.
- 15 The anniversary of his cryopreservation is still commemorated within the cryonics community.
- 16 At www.dezeen.com, 14 June 2016.
- 17 Linda Yueh, 'Frigeonomics and a "Zero Waste" World', www.bbc.co.uk, accessed February 2015.
- 18 See www.thesurvivalistblog.net, accessed May 2016.
- 19 At www.conceptkitchen2025.com, accessed June 2015.
- 20 Adrian Burton, 'Solar Thrill: Using the Sun to Cool Vaccines', *Environmental Health Perspectives*, cxv/4 (April 2007), pp. A208–A211.

SELECT BIBLIOGRAPHY

- Attfield, Judy, *Bringing Modernity Home: Writings on Popular Design and Material Culture* (Manchester, 2007)
- Barthes, Roland, 'Ornamental Cookery', in *Mythologies*, trans. Annette Laver (New York, 1991), originally published in French (Paris, 1957)
- Boxshall, Jan, '*Good Housekeeping*' *Every Home Should Have One: Seventy-five Years of Change in the Home* (London, 1997)
- Busch, Akiko, 'Refrigerator', in Akiko Busch, *The Uncommon Life of Common Objects: Essays on Design and the Everyday* (New York, 2005), pp. 100–110
- Cooper, Alan, *World Below Zero: A History of Refrigeration in the UK* (Aylesbury, 1997)
- Corley, T. A., *Domestic Electrical Appliances* (London, 1966)
- Cowan, Ruth Schwartz, 'How the Refrigerator Got its Hum', in *The Social Shaping of Technology: How the Refrigerator Got its Hum*, ed. Donald MacKenzie and Judy Wajcman (Manchester, 1985), pp. 202–18
- Cox, Rosie, 'Dishing the Dirt: Dirt in the Home', in Rosie Cox et al., *Dirt: The Filthy Reality of Everyday Life* (London, 2011), pp. 37–74
- David, Elizabeth, *Harvest of the Cold Months: The Social History of Ice and Ices* (New York, 1994)
- Forty, Adrian, *Objects of Desire: Design and Society since 1750* (London, 1986)
- Freidberg, Susanne, *Fresh: A Perishable History* (Cambridge, MA, 2010)
- Gansky, P., 'Refrigerator Design and Masculinity in Postwar Media, 1946–1960', *Studies in Popular Culture*, xxxiv/1 (2011), pp. 67–85
- Gantz, Carroll, *Refrigeration: A History* (Jefferson, NC, 2015)

- Giard, Luce, 'Doing-cooking', in Michel de Certeau, Luce Giard and Pierre Mayol, trans. Timothy J. Tomasik, *The Practice of Everyday Life*, vol. II: *Living and Cooking* (London, 1998), originally published as *L'Invention au quotidien, II, habiter, cuisiner* (Paris, 1994)
- Heathcote, Edwin, *The Meaning of Home* (London, 2012)
- Highmore, Ben, *The Great Indoors: At Home in the Modern British House* (London, 2014)
- Irley, Merritt, *The Comforts of Home: The American House and the Evolution of Modern Convenience* (New York, 1999)
- Nickles, Shelley, 'Preserving Women: Refrigerator Design as Social Process in the 1930s', *Technology and Culture*, XLIII/4 (2002), pp. 693–727
- Rees, Jonathan, *Refrigeration Nation: A History of Ice, Appliances, and Enterprise in America* (Baltimore, MD, 2013)
- Roberts, Elizabeth, *Women and Families: An Oral History, 1940–1970* (Oxford, 1995)
- Rudolph, Nicole C., *At Home in Postwar France: Modern Mass Housing and the Right to Comfort* (Oxford, 2015)
- Rutherford, Janice Williams, *Selling Mrs Consumer: Christine Frederick and the Rise of Household Efficiency* (Athens, GA, 2003)
- Sparke, Penny, *Domestic Appliances* (London, 1987)
- Stevenson, Alexander, *Report on Domestic Refrigerating Machines, 1923–1925* (Schenectady, NY, 1923, with additions in 1924 and 25), p. 164, www.ashrae.org, accessed 16 March 2016
- Ward, Peter, *A History of Domestic Space: Privacy and the Canadian Home* (Vancouver, 1999)
- Watkins, Helen, 'Fridge Space: Journeys of the Domestic Refrigerator', PhD thesis, University of Columbia, New York (2008), www.open.library.ubc.ca, accessed 28 May 2015
- Weightman, Gavin, *The Frozen Water Trade* (New York, 2003)
- Wilson, Bee, *Consider the Fork: A History of How We Cook and Eat* (London, 2012)
- Woodham, Jonathan, *Twentieth-century Design* (Oxford, 1997)

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