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Understanding plastic packaging: The co-evolution of materials and society

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ABSTRACT

In recent years, the environmental problems associated with plastics have become a matter of global concern. Current responses seek to replace plastics with other materials, however it is not yet clear that these alternatives will deliver improved environmental outcomes. There remains an urgent need for more nuanced understandings of plastics, their role in society, and their environmental impacts. Drawing on social science perspectives that emphasise the co-evolution of materials and society, this paper outlines a socio-technical approach to plastics and social change. In this view, plastics are understood in terms of the networks and relations of which they are part – highlighting the limitations of both technological solutions and the blanket condemnation of particular materials. The analysis focuses specifically on plastic packaging, exploring the interplay of technological innovation and consumer practices to better account for processes of change. Our arguments are advanced through reference to three case studies: the launch of a ‘roast in the bag’ chicken by a food retailer, the switch to compostable packaging by a potato crisps (chips) brand, and the refilling of plastic bottles by a cosmetics company. Particular attention is paid to the relationships between commercial, environmental and regulatory concerns. To conclude, we consider implications of the approach presented here for transdisciplinary and policy debates about the problems associated with single-use plastics.

1. Introduction

The global environmental impacts associated with plastics, their use and their disposal are increasingly a matter of concern to producers, consumers and governments. In the context of growing awareness of these issues, plastics have been positioned as particularly troublesome materials that bear significant responsibility for current ecological crises. The blanket condemnation of plastics coupled with the race to offer ‘cleaner’ single-use materials – or do away with them entirely – runs the risk of perverse outcomes. For example, with many supermarkets now launching ‘plastic free’ trials in their stores there is a risk that more food will be wasted (Denkstatt, 2010). Similarly, replacing fossil-based with bio-based plastic may seem like a sensible approach, however the relative environmental impacts of each is dependent on how the material is produced, used and disposed of (Walker and Rothman, 2020). Without disputing the nature and extent of the problems associated with plastics – ranging from Green House Gas emissions to marine pollution – our view in this paper is that industry and policy responses should be informed by the best evidence on the outcomes of different solutions. Any claim that plastics are better than their alternatives is inherently controversial and dependent on the criteria that are used to measure the impacts of particular materials.

Nevertheless, it points to the need for more nuanced understandings of plastics. This paper does not intervene in debates about the environmental impacts of plastics or technical questions of how best to assess these. It considers a complementary set of issues that contributes to the task of nuancing how plastics are understood. Drawing on perspectives that take seriously the role of technologies in processes of social organisation and social change, we join the nascent body of social science research that engages with plastics as material culture (for example Hawkins et al., 2015; Liboiron, 2016). Specifically, we respond to a recent call for more studies that explore the ‘norms and practices that maintain the role of plastics in society’ (Nielsen et al., 2020).

We view the task of understanding and changing the role of plastics in society as germane to the wider research and policy agenda of Sustainable Consumption and Production (SCP). In a critical appraisal of SCP research, Geels et al. (2015) identify three broad positions: 1) the reformist position, which focuses on improvements in technological efficiency and incremental changes in consumer behaviour; 2) the revolutionary position, which calls for a radical overhaul of global consumer capitalism, and 3) the reconfiguration position, which explores transitions in socio-technical systems and the dynamics of everyday consumption practices. Following Geels et al. and a series of other contributions to this journal (for example Spaargaren, 2011; Strengers

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and Maller, 2012; Greene, 2018; Watson et al., 2020), we adopt a re-configuration approach to our analysis of plastics. Our core argument is that plastics and society ‘co-evolve’ (cf. Shove, 2003) such that processes of change – both in terms of how plastics have come to occupy a central role in contemporary societies and in relation to efforts to promote positive transformation – are understood as socio-technical (cf. Bijker, 1997), involving shifting configurations of heterogeneous elements (for example firms, policymakers, consumers and technologies). By extension, we suggest that theoretical and practical engagement with plastics requires attention to the networks and relations of which they are part.

In doing so, we take a cue from the growing body of research that links consumption to the organisation and dynamics of social practices (see Shove et al., 2012). Existing studies provide a powerful corrective to the overemphasis on individuals – their attitudes, behaviours and choices (Shove, 2010) – in environmental policy. The social practices perspective suggests that environmentally damaging patterns of consumption are not a problem and possibility of individual consumer behaviour, rather, they relate to the collective development and reproduction of normality (Shove, 2003). Consumption is argued to not arise for its own sake but in order to accomplish everyday practices in accordance with prevailing standards of appropriate conduct (Warde, 2005). It follows that resource-intensive activities such as the frequent laundering of clothing are carried out routinely without too much in the way of conscious deliberation (Yates and Evans, 2016). They are thus shared and social practices rather than individual behaviours. The distinction is more than semantic insofar as practices are configured by the integration and alignment of disparate and heterogeneous elements including materials, infrastructures, institutions, meanings, and representations.

These ideas have developed through the analysis of so-called inconspicuous forms of consumption (for example water and energy use). Attention has been paid to the services that resources provide (for example, energy and water deliver cleanliness in laundry practices), the appliances that use resources (for example washing machines), and how escalating demand for resources is explained by the co-evolution of technologies and practices (washing machines and related utility infrastructures not only make frequent laundering possible, they also shift societal understandings of ‘cleanliness’). In this paper, we extend these ideas to the analysis of plastics. There are practical implications – for environmental policy and corporate sustainability strategy – of acknowledging the complex networks (of materials and users) in which plastics are embedded, societal lock-in to the services that plastics provide, and the dynamics of consumer practice. Further, an empirical focus on plastics pushes a number of theoretical developments related to the agency of materials and the locus of environmental responsibility.

Our arguments proceed via a focus on plastic packaging. We consider a series of case studies that reveal some of the reasons why plastics have become embedded in everyday practices as well as some of the mechanisms through which things do – or do not – change. In doing so, we contribute to the development of social scientific understandings of current packaging arrangements and the pursuit of more sustainable alternatives (see for example Cochoy, 2011; Hawkins et al., 2015; Fuentes and Fuentes, 2017; Fuentes et al., 2019). The following section provides more detail on the interdisciplinary project that underpins this research alongside our approach to the selection and analysis of cases. We then discuss each of the cases in turn: the launch of a ‘roast in the bag’ chicken by a food retailer (Marks & Spencer), the switch to compostable packaging by a potato crisps (chips) brand (Frito-Lay), and the development of refilling and reuse practices for plastic bottles by a cosmetics company (The Body Shop). In each case, we highlight the interplay of technological innovation and consumer practices alongside the relationships between commercial, environmental and regulatory concerns. Our conclusion considers the implications of the approach taken here for transdisciplinary and policy debates about addressing the

problems associated with single-use plastics alongside our theoretical advances and contributions to the reconfiguration perspective on SCP.

2. Research context

This paper is part of a research project funded by the UK’s Engineering and Physical Sciences Research Council (EPSRC).¹ The project brings together scientists, engineers, social scientists and researchers from the arts and humanities to address the ecological and societal problem posed by plastics. It seeks to understand the whole plastics system, looking at how regulation and design can influence practice at all stages from polymer production and product development through to retail management and consumer behaviour. The analysis that follows derives from research that aims to situate single-use plastics in relation to wider processes of social change. As part of this work, we initiated a number of case studies to better understand how plastic packaging develops and changes. The cases were identified through dialogue with the interdisciplinary project team. The aim was to develop understandings of socio-technical change and so sampling was purposive and theoretical.

The first case (Marks & Spencer) was chosen to explore the relationships between plastics and food safety agendas. It involved moderate technological innovation and highlights how perceptions of consumer demand contribute to the escalating use of plastics as well as how plastics are well placed to respond to the ‘needs’ that they play a role in creating. The second case (Frito Lay) was chosen to explore the process of replacing petroleum-based plastic packaging with alternative materials. It involved considerable technological innovation and highlights how prevailing societal norms, meanings and standards in consumer practices pose significant barriers to change. The final case (The Body Shop) was chosen to explore refilling and reuse arrangements as an alternative to single-use packaging (plastic or otherwise). It involved no technological innovation but highlights how the success or failure of refilling and reuse depends on economic and regulatory factors, environmental and Corporate Social Responsibility (CSR) agendas, and everyday consumer practices. In common with previous ‘reconfiguration’ studies of SCP, we adopted a qualitative longitudinal approach to each of the cases (Geels et al., 2015) in which diverse data sources were drawn together in order to explore changing configurations of heterogeneous elements. This can be thought of as a ‘facet’ methodology (Mason, 2011) in which ‘partial’ data offer ‘flashes’ of insight that the researcher/s weave together in order to articulate and illuminate the overall object of concern. Each case study involved a range of sources including technical reports, press releases, market research data, social media commentary, interviews, company archives and biographical accounts.

These data were analysed using key concepts associated with the social practices approach to (sustainable) consumption. For example, attention was paid to the services that plastics provide, the shared and social dimensions of consumption, and the heterogeneous elements that shape consumer practices (materials, meanings and competences – see Shove et al., 2012). Parallel to this, we explored the relationship between technological innovation and the organization of these practices. For example, attention was paid to the mechanisms by which plastics both create and respond to societal needs and expectations (for example, of safety or convenience). Since the analysis involved a sustained effort to nuance understandings of plastics by situating them in the context of broader socio-technical arrangements, we necessarily addressed questions about the locus of environmental responsibility. For example, we looked at how the blame for negative outcomes and responsibilities for affecting positive changes gets distributed (Barnett et al., 2011; Evans et al., 2017) across different materials (for example plastics) and actors (for example consumers). The analysis was carried

¹ Award number EP/S025278/1.

out by a team of social scientists in close collaboration with a polymer scientist and technical packaging expert, reflecting both the inter-disciplinary nature of the project and a theoretical commitment to relational materialist perspectives. For example, we explored the materiality of plastics in order to better understand their agency and responsibility *vis-à-vis* the wider networks in which they are embedded (cf. Liboiron, 2016). Finally, attention was paid to the lessons that can be drawn out of these historical cases for current efforts to develop alternatives to single-use plastic packaging. We turn now to a presentation and discussion of each case study.

3. Marks & Spencer: roast in the bag chickens

Our first case study considers the introduction of ‘ovenable trays’ by Marks & Spencer (M&S), highlighting the relationships between packaging and food safety agendas. In doing so, it draws out the role of plastics in shaping and responding to consumer demand. M&S is a retailer that specialises in higher quality food offerings as compared to most other supermarkets in the UK. In 2014, they announced that they would sell whole chickens in special packaging that enabled consumers to ‘roast in the bag’, obviating the need to touch or handle the raw product (see Fig. 1). The packaging was developed as a response to public health concerns about *Campylobacter*, a bacterium that causes food poisoning as a result of people handling raw chicken. It involved the combination of existing materials (principally an aluminium tray and a PET film formed into a bag) as well as making sure that the film, especially the sealing layer, remains stable at temperature. This is therefore a relatively recent example of more general tendencies for the use of plastics to increase in response to changes in food safety and hygiene standards (cf. Hawkins, 2018 on clingfilm).

The first thing to note is that there exists ample evidence that people were already anxious about handling raw chicken prior to *Campylobacter* rising up the public agenda in the UK. For example, in

Jackson et al.’s, 2010 study of food anxieties, one consumer notes that ‘The meat that you worry about most is chicken isn’t it? ‘Cause it’s like you can get so many different things from it’. Another takes extreme measures to avoid touching raw meat:

“I hate handling raw chicken. I tend to do it with rubber gloves because I keep thinking salmonella urgh or whatever... and I’m quite careful about how I handle it because I think probably all chicken’s got salmonella ... I don’t like touching it either, so I do it with rubber gloves and then wash my hands really well.” (Jackson et al., 2010: 181)

Referring to the process of cutting up a whole chicken, one interviewee expressed concern about ‘the gunge and the fat and everything ... it’s just a mess really [leaving] your bread board and your kitchen bench and everything all covered in this slimy horrible gunge’. Another respondent bleached all her knives and boards, washing them down after cooking ‘to make sure it’s free of any bugs ... so I don’t poison me and my housemates’ (ibid.: 181). In the context of these anxieties, an ovenable tray that obviates the need to handle raw chicken appears a useful innovation.

At this juncture, we note that it is important to recognise what plastics do. Amid politically and morally charged commentary and evidence concerning the negative aspects of plastics –including adverse health effects (Glausiusz, 2014) as well as environmental impacts – it is easy to forget that plastics can be very useful. Indeed, there are good reasons why they have come to occupy such a central position in any number of socio-technical arrangements. Echoing the social practices conceit that people do not consume resources directly, it seems credible to suggest here that people do not use plastics *per se*, rather they use the services that they provide. In this case plastics deliver the required standards of food safety in a manner that is convenient. In common with recent studies calling for greater attention to the relationship between meanings and materials in food practices (Biermann and Rau, 2020), we note that the ovenable tray changes the meaning of chicken. Where visceral engagement with raw chicken serves as a reminder that a dead animal is about to be cooked and eaten, the ovenable tray obfuscates the need for this encounter and thus leaves intact the ability of packaging to render slaughtered animals as edible food products. Viewed as such, and leaving aside the adverse consequence of this development, plastics offer the unique combination of attributes – a protective barrier, stability at high temperatures, affordability – that make the ovenable tray a viable solution to consumer anxieties about handling raw meat.

Building on this, it is useful to situate the ovenable tray in relation to M&S’ more general corporate strategy surrounding its food – especially poultry – offerings. A key theme here is that consumers are increasingly disconnected from food production and do not want to be educated about farming practices. For example, Catherine Lee, an M&S poultry buyer, comments:

“We’ve moved so away from, so away from a rural environment ... that the majority of the population live in a town, you know, they don’t really see a live chicken on a day to day basis anymore and therefore they’ve become squeamish about dealing with the consequences of that. They’ve become disassociated with it you know.” (Jackson et al., 2010: 182).

She suggests that persuading M&S customers about the quality of their produce would require them to grasp ‘a whole proposition of agriculture’ including animal welfare, stocking densities, improved diet and longer growing cycles (ibid.: 183). Her argument is that consumers – by virtue of their distance from and lack of knowledge about the food that they eat – are too squeamish to receive or act on this information.

More generally, consumers’ alleged lack of knowledge is said to pose challenges for the poultry industry. For example, Ray Moore, a hatchery manager, suggests that young children ‘don’t know where an egg comes from, [they think] it comes out of a cardboard case’ (Jackson et al.,



Fig. 1. . M&S roast in the bag chicken (image reproduced with the permission of Solent News).

2010: 178). Similarly, Audrey Kley, a chicken grower, criticises ‘the housewife’ who is only interested in buying ‘the cheapest chicken that she can’ without looking to see where it’s come from or how it’s produced (ibid.: 179). She continues:

“I mean they ... just think that you take the thing out of its bag, you fling it in the microwave, and that’s not the right way to cook a chicken... Or they fling it in the oven, half frozen.” (ibid.: 180)

While claims about certain categories of consumers (e.g. young people or ‘housewives’) becoming alienated from the food system should necessarily be treated with caution, it does help explain why M&S favoured a technological solution to Campylobacter over an attempt to communicate complex information to consumers in order to change how they handle raw chicken. By pursuing a technological solution, M&S were able to offer a response that was both convenient for consumers (requiring no significant changes in behaviour) and ‘clean’ enough to assuage anxieties about handling risky foodstuffs. This technological solution would not have been possible without plastics and, at first glance, it appears to be a win–win option.

It is nevertheless important to acknowledge the historical role that plastics have played in creating the requirement for solutions that are safe and convenient (cf. Shove, 2003). For example, if the suitability of technological solutions rests principally on the assumption that consumers lack the requisite knowledge about food production and food handling, then the role of plastics and packaging in these processes must be acknowledged. Indeed, both of the examples above casually mention packaging as a cause of consumers becoming less knowledgeable about where chicken comes from and how they should handle it. Packaging enables food to be transported, thus creating distance between sites and spaces of production and consumption. It conceals certain aspects of production and creates a physical barrier to sensory engagement with food. It also gives information (for example nutrition and date labelling) and communicates with consumers (for example

through branding) in ways that render food economic (cf. Cochoy, 2011; Hawkins et al., 2015) – a commodity to be exchanged. Viewed as such, it seems credible to suggest that to the extent that plastics are useful, they are very often responding to problems that they have themselves played an active role in creating.

Finally, this case is instructive for thinking about the locus of responsibility for change. At one level, it stands in stark contrast to the orthodoxy of addressing food-system challenges through references to changes in individual consumer behaviour. The technological solution was nevertheless presented as a response to ‘consumer demand’ for a solution and is unambiguously an intervention in domestic practices. It is therefore useful to reflect on where this demand – and the underlying anxieties – come from. In the case of Campylobacter, official advice from the UK’s Food Standards Agency (FSA) played a role. Prior to the launch of the ovenable chicken tray, the FSA had been actively campaigning and warning of the dangers of cross-contamination, for example from washing raw chicken under the kitchen tap. They had become increasingly frustrated by the ‘failure’ of consumers to follow their advice and so encouraged retailers such as M&S to provide a convenient solution to the apparent risks involved in touching chicken. This observation recalls arguments (see Barnett et al., 2011; Evans et al., 2017) that the politics of consumption very often involve organisations and intermediaries lobbying corporations through reference to the real and discursive figure of ‘the consumer’. While the company was praised for its technological solution to a ‘consumer’ problem, the innovation would arguably not have been necessary if the risk of Campylobacter had been addressed further back along the supply chain (on the farm or in the manufacturing process).

4. Frito-Lay’s compostable crisp packaging

Our second case study considers Frito-Lay’s attempt to introduce a more sustainable alternative to conventional crisp (potato chip) packaging, drawing out themes related to the interplay of technological innovation and the wider (socio-cultural and spatial) context of consumption. Frito-Lay is a crisp brand owned by PepsiCo who, in 2010, switched from standard unrecyclable packaging to ‘100% compostable’² materials for their SunChips line (see Fig. 2). SunChips are marketed as a wholesome wholegrain snack and the switch in packaging was a response to perceived consumer demand for more sustainable product offerings. The development of the compostable packaging can usefully be situated in relation to a broader suite of initiatives, such as switching production to a solar powered facility in 2008.

Crisp packets are made using a multilayer construction. The plastic film from which the bags are formed needs to offer a moisture, gas and light barrier, be heat-sealable, printable, and be aesthetically appealing. This is not possible from a single material, so a combination of materials and coatings are used. These complex structures are non-recyclable through standard mechanical recycling. There is an argument, therefore, that if these complex films could be made using compostable materials, then they can be disposed of via composting, rather than by landfill or incineration, which is their current destiny. SunChips switched production to a plant-based polymer, polylactic acid (PLA), typically made from cornstarch. Doing so required significant technological innovation, including figuring out how to print on the material (as Rocco Papalia, Leader of Advanced Research at PepsiCo notes ‘this stuff didn’t want to be printed on’), how to run it through the machines used



Fig. 2. . SunChips compostable crisp packet (image reproduced with the permission of Mintel GNPD).

² There is some dispute as to whether or not the packaging innovation was 100% compostable. For reasons of brevity, we do not discuss this in detail here. It is sufficient to note that despite achieving third party certification from the Biodegradable Products Institute, the packaging was only realistically compostable under industrial conditions. Later iterations of the packaging were not constituted from 100% compostable materials but nevertheless cleared the 90% threshold required (Glaberson, 2011).

to make the bags, and how to seal them such that they adequately protect the product (3BL Media, 2011). The process of switching from a non-recyclable petroleum based crisp packet into a non-petroleum based compostable bag took three years and was three times as expensive as standard packaging (ibid.). Accepting that conventional plastics are very useful materials for food packaging, this innovation can be interpreted as an attempt to deliver similar services (freshness, marketability) using materials that have fewer adverse consequences.

The new packaging was released on Earth Day, April 22nd, 2010. Rather than being celebrated as a sustainable alternative to conventional crisp packaging, it was met with widespread criticism. The innovation failed and, after just six months, the packaging was withdrawn for the majority of their flavours. Despite the PLA bag delivering the same quality of product (maintaining 'freshness' and requiring no changes to the crisps themselves) and meeting the demands of offering an informative and eye-catching packet, it performed far worse than its petroleum counterpart in one crucial regard. The bag was much noisier than a conventional crisp packet, gaining notoriety for a 'glass like' crinkling sound when handled. The change in sound was due to the specific mechanical properties of the PLA film. Parody adverts presented the packet being used as a tool to alert others to potential danger (Karik6789, 2010). One YouTube video compared the crisp packet to a chainsaw (Multipleshotsfred, 2010), whilst another noted the decibel reading is similar to that of a subway train (Heathaplexvision, 2010). SunChips were aware of the increase in noise and sought to make a virtue out of it, branding the noisy packet as "the new sound of green" (PepsiCo, 2010). Rocco Papalia later commented (3BL Media, 2011) that they "had to have earmuffs in the plants when we were making the bags" and so put a "burst" on the bag warning that it is loud, trusting that consumers would agree it is not "a big price to pay" for the environmental benefits of a more sustainable packaging material.

The public response to – and ultimate failure of – the packaging suggests that SunChips made a series of errors in their understandings of consumer demand. First, the environmental benefits of the packaging were not sufficient to compensate for the increased noise, which crossed what many consider to be an acceptable threshold. As one YouTube blogger points out:

"I'm a big fan of recycling [...] but this bag [...] is so freaking loud and I tell you what, as a pilot, the inside of the cockpit of my jet isn't even this loud." (Heathaplexvision, 2010)

Second, noise and environmental benefits are, for many, unrelated factors that cannot be readily traded off against each other. For example:

"The fact that it's loud and the fact that it's good for the planet have nothing to do with each other, for me, they're just loud okay." (Sandora-Nastyn, 2011)

Perhaps unsurprisingly, commentators presented consumers as selfish and overprivileged for complaining about the noise of a more sustainable alternative to crisp packaging (Terry, 2010), implying that they have the wrong attitudes and make suboptimal choices.

The conceptual resources that frame this paper offer a different interpretation, suggesting that the issue is not a straightforward matter of individual preferences. They invite greater attention to the wider context of crisp consumption as well as the norms and prescriptions that shape food practices (Plessz et al., 2016). The noise of packaging is not simply a matter of irritation for the person consuming the crisps, rather, the problem relates to the ways in which noisy packaging might disturb other people. As one consumer pointed out:

"If you wanna get one chip out of this bag good luck because people are gonna be pissed off around you. It's the loudest bag in the world." (Sandora-Nastyn, 2009)

Another commented that she could not make her packed lunch in the morning without shutting herself in the pantry so as not to wake up

everyone else in the house (WLUK-TV Fox 11, 2010). Already, then, more is at stake here than individual consumers putting their own pleasure, experience and dislike of noise above the imperatives of environmental stewardship.

Relatedly, crisp eating is associated with a range of practices (such as commuting) and spaces (such as movie theatres) where noise should be kept to a minimum (Yuhnke, 2010; Mazsterful, 2010). We note that both the centrality of crisp consumption in these spaces and practices, and the requirement for noise to be minimised has less to do with individual consumer preferences than it does the collective organisation of everyday life (cf. Warde, 2005; Greene, 2018). Moreover, this example suggests that materials cannot simply be substituted within existing practices without being noticed, nor can their introduction guarantee the required changes in other elements of practices (cf. House, 2019). It seems credible to suggest that the persistence of other elements – such as norms and standards of appropriate conduct – place limits on the potential for technological solutions to the adverse environmental consequences of particular food practices. A key issue in this regard is that the noise of the new material brings the meanings of crisp eating sharply into focus, both in and outside of the home (cf. Biermann and Rau, 2020). There is stigma and shame associated with snacking and the consumption of 'junk' food such as crisps. People may not wish to draw attention to themselves when engaging in behaviours that they do not want others to witness. As one consumer notes 'I'm telling ya, you can't get that midnight snack, all of a sudden you're caught it's like ahhh!' (3BL Media, 2011). Similarly, the new packaging was thought to remove the 'sneak' factor when taking crisps into the library or cinema (Heathaplexvision, 2010).

One commentator seemed cognisant of this issue when making the (presumably humorous) suggestion:

"If they're so loud, maybe people are going to start getting embarrassed, maybe we should just start using it as a dieting tool. You have the loud bag, you know, you won't eat chips anymore 'cause you don't want anyone to know about your habit." (TheAlyonaShow, 2010)

Given the well-documented challenges of breaking 'bad' dietary habits and the persistence of the value-action gap between the intention to eat healthily and actually doing so (see Jackson et al., 2018), it hardly seems productive to suggest that noisy bags can be put in the service of public health agendas. What it does highlight, however, are some of the reasons why consumers may not be keen to eat crisps out of noisy bags. Once again, there is clearly much more at stake here – including the historical formation and persistence of dietary habits alongside their associations with notions and meanings of guilt and shame – than a simple trade-off between noise and environmental benefits.

5. The Boston bottle and the Body Shop

Our final case study considers the use of Boston bottles in the history of The Body Shop, drawing out themes related to the interplay of technological, commercial, environmental and regulatory concerns as well as the relationships between packaging and convenience. The Body Shop is a cosmetic company founded in England in 1976 that has long-standing associations with a range of sustainability and CSR agendas. Boston bottles made from semi-opaque High-Density Polyethylene (HDPE) are synonymous with how The Body Shop packaged their offerings (see Fig. 3) until 1999 (Finch, 1999; Greenwood, 2018). The Boston is a classic, generic, shape that makes bottles strong, functional and space efficient. Originally made from (and still available in) glass, they are now more commonly made from plastic. When Anita Roddick opened the first Body Shop in Brighton, Boston bottles were most commonly used in chemical and pharmaceutical applications (for example by hospitals as urine sample bottles). Roddick reports that she chose off-the-shelf Bostons because they were the cheapest plastic



Fig. 3. . The Boston bottle (image reproduced with the permission of Sarah Greenwood).

container that performed the same functions – or delivered the same services – as the more elaborate and ostentatious packaging materials typically used in the cosmetics industry.³

On opening her original shop, Roddick sold a small range of cosmetics in five different sizes. The bottles were labelled with generic stickers and hand-written descriptions. Since Roddick could not afford to buy enough of the bottles to stock her shop, her solution was to adopt reuse and refilling practices. Viewed as such, this case anticipates what are now seen as very innovative organisational solutions to the problems associated with single-use plastic packaging (see [Ellen MacArthur Foundation, 2019](#)). Using only the Boston bottle meant that if a product did not sell, the packaging could easily be repurposed for another line, thus mitigating economic losses and permitting greater experimentation ([Roddick, 1991: 102](#)). In many ways, then, both the use and re-use of the Boston bottle was a response to economic necessity. It also aligned with the company's ethical and environmental agendas. As Roddick comments, “in this way we started recycling and reusing materials long before it became ecologically fashionable” (2000: 37).

The alignment between economic and environmental considerations is made possible by shared emphasis on resource efficiency. In addition to being an example of ecological modernization in retail (cf. [Hajer, 1995; Mol et al., 2009](#)), the case can be interpreted as an effort to enrol consumers in these agendas. Roddick explains how The Body Shop's approach to packaging drew on notions of thrift, which she suggests were already familiar to older, female consumers. Discussing her approach to retail, she explains:

“I ran my shop just like my mother ran her house in the Second World War – refilling, reusing and recycling everything.” (2000: 37)

This recalls accounts that emphasise the interplay of economy and

³ It is noteworthy that in this case, plastics were positioned as an antidote to the perceived excesses of consumerism. This stands in stark contrast to their current status as an icon of a ‘throwaway society’.

environment in practices of thrift and frugality (see [Evans, 2011](#)). Again, it anticipates more recent efforts to mobilise a ‘make do and mend’ ethos in response to the twin challenges of economic austerity and environmental sustainability (see [Hulme, 2019](#)).

Turning now to the environmental claims made by or about The Body Shop, ethical campaigning (seemingly divorced from economic necessity) became a key feature of the company's strategy as it grew throughout the 1980's and 1990's. It engaged with a range of causes including animal rights, acid rain, the preservation of the rainforests, in-store recycling, and opposition to the use of CFCs in aerosols. There are nevertheless examples of how the company may not have been as green as they first appear. For example, the walls in The Body Shop stores were painted dark green and this is considered symbolic of their involvement in environmental issues ([Roddick, 2000](#)). It is instructive to note that Roddick did not do this as an “environmental statement”, rather, it was the only colour that would cover the damp patches in her original store ([Roddick, 1991: 74](#)). More substantively, the company's commitment to reusing plastic bottles seems not to have extended to the plastic bottles that were used to transport the product in bulk. [Roddick \(1991: 83\)](#) reports that she would ‘decant the stuff into whatever size bottles I needed on the shelves’ then cut containers in half with a bread knife to ‘scrape out every last drop’. While this avoided wastage of the product, it rendered the container completely unusable. This highlights the importance of addressing the problems associated with single-use plastics across the entirety of the value chain rather than reducing them to a matter of the retailer-consumer interface at the ‘end of pipe’.

As time moved on and as the company grew, they stuck with the shape of the Boston bottle but made a number of changes, including the addition of an embossed screw-cap, a switch to high clarity Polyethylene Terephthalate (PET), and modification to the label design ([Greenwood, 2018](#)). In 1999, when sales started to decline, they took the decision to introduce new styles of packaging and to differentiate the bottles that they used ([Finch, 1999](#)). Shortly after, in 2002, they stopped their refill service citing that only 1% of customers were using it ([Dawson, 2014](#)). [Lofthouse and Bhamra \(2006\)](#) suggest high levels of inconvenience underpinned this outcome. To this we would add that the dominance of a more convenient arrangement – purchasing cosmetics and toiletries in single-use bottles – can only be understood in relation to the collective development or social organisation of normality ([Shove, 2003](#)). Relevant factors include the changing nature of retail and emergence of self-service, the shifting geographies of where people shop and where they live, and the temporal organisation of everyday life ([Southerton, 2013](#)). Viewed as such, people are ‘locked in’ to convenience at a societal level meaning that solutions should not be premised on notions of consumer blame or responsibility, rather, they should focus on the broader socio-technical arrangement.

Finally, when The Body Shop expanded into the American market in 1988, their model of re-using plastic bottles encountered further obstacles. They were warned that such an approach may present ‘insuperable insurance problems’ ([Roddick, 1991: 134](#)). While they went ahead regardless, they ultimately changed their trading practices to align more clearly with the regulatory contexts in which they operate. By the late-1980's, even in the UK, refills could only be made in their own bottles, and only for the original product. This was for reasons of health and safety. Where Roddick viewed ‘boring old bottles with green labels’ ([Roddick, 1991](#)) as a mere vessel for her products, this case highlights that packaging ultimately proved necessary in order to provide the required services and standards of safety and accountability that the Body Shop were responsible for. Again, broader legal and regulatory imperatives around public health can be seen to drive the use of packaging (specifically plastic packaging) and create barriers to refilling and reuse.

6. Discussion and conclusions

This paper has outlined a socio-technical approach to plastic

packaging, emphasising the co-evolution of materials and society. Drawing on a range of case study examples, the analysis has explored some of the mechanisms through which packaging – and attendant consumer practice – changes. Attention has been paid to the normalisation of plastics in food practices (the ovenable chicken tray), the limitations of technological solutions that seek to replace plastics with alternative materials (Frito-Lay's crisp packaging), and the factors influencing the success or failure of efforts to move away from single-use packaging altogether (The Body Shop's Boston bottle). These insights contribute evidence and understandings of the arrangements – including commercial, regulatory and socio-cultural elements – that maintain the centrality of plastics in contemporary society.

Cutting across these examples is our core argument that plastics can only be understood in terms of the wider networks and relations of which they are part. To elaborate: while fundamental social changes and much of what is taken for granted today would not, perhaps could not, have happened without plastics, the mere existence of plastics does not fully account for their ubiquity in contemporary economic and social life. In the case of food packaging, for example, the properties and qualities that make plastics a useful and suitable material do not fully explain their widespread use. While this is no doubt an important part of the story, a more comprehensive account requires attention to a range of other factors, including the rise of supermarkets, legacies of urban planning and housing development, related technological developments (e.g. the microwave), and shifts in societal and domestic divisions of labour. Any attempt to bring about changes in the use and disposal of plastics must be grounded in understanding how things come to be as they are in the first place (cf. Molotch, 2004; Miodownik, 2014). This requires attention to the services that plastics provide as well as a more general recognition of the 'whole' picture and understanding that stabilised socio-technical arrangements cannot be 'undone' by changing one piece of the jigsaw.

A socio-technical approach to plastic packaging challenges a linear view of social change following technological innovation. Our analysis suggests it cannot be assumed that dispensing with plastics or replacing them with other materials is the best solution to the problems associated with single-use plastics. In the case of The Body Shop, for example, the issue had far less to do with technologies and materials than with the legal requirements that made it difficult to reuse and refill packaging, plastic or otherwise. It seems credible to suggest that addressing the regulatory context of packaging is an important lever of change. Similarly, the Frito-Lays example highlights how existing norms, meanings and expectations require attention in order for new materials and technologies to successfully reconfigure practices in a more sustainable register. In both cases, the services that plastics provide – freshness, convenience, safety, accountability and affordability – are key. While commercially and culturally significant, these categories cannot be assumed to have a priori meaning (cf. Jackson et al., 2019). They are inherently malleable and historically variable, meaning that changing societal standards and societal expectations influence trajectories of technological development and *vice versa* (cf. Evans and Mylan, 2019). Accepting that the contemporary standards and expectations that drive the use of plastics are the outcome of socio-technical processes of co-evolution (Shove, 2003), it follows that solutions and change require more than 'getting the technology right' and then encouraging consumer acceptance. They require attention to questions of cultural appropriateness, their contingency, and their complex relationships with technological innovation.

These insights have implications for what we refer to as the 'locus of responsibility' for improving environmental sustainability. This paper opened with discussion of the need for more nuanced understandings of plastics with which to counter the blanket condemnation that characterises current debate and responses. Existing efforts to develop these understandings highlight the need for more robust evidence on the environmental impacts of plastics *vis-à-vis* their alternatives. These developments promote a view that plastics are not the problem *per se*,

rather, it is the way that people use them. By focusing on the socio-technical arrangements that lead to problematic outcomes, our analysis complements this position and suggests that plastics cannot be simply blamed for the problems that they are now associated with. It does, however, depart from and extend this view by suggesting a more diffuse model of environmental responsibility that refuses to blame consumers (users) in the abstract or in isolation. In addition to emphasising the embeddedness of plastics in *social* practices, we have demonstrated that 'lock-in' to the services and standards that plastics provide (notably convenience) arises at a socio-technical rather than individual level. By nuancing understandings of plastics in this way, we do not wish to lose sight of their adverse consequences. We nevertheless wish to emphasise that an overemphasis on 'consumers' and domestic practices in response to these issues elides both the systemic nature of their causes (Evans et al., 2017) and the need to address organisational practices (cf. Goggins and Rau, 2016) involving the (single) use of plastics. We also note that disproportionate attention to plastics and packaging may distract from other socially and environmentally problematic arrangements in the food and cosmetics industries (for example labour conditions, animal welfare, deforestation).

Taken together, these points are relevant to policy and industry efforts to address the problems associated with plastic packaging. In doing so, the limitations of reformist approaches – requiring no significant changes to the status quo – that are premised on replacing plastics with other materials and encouraging attendant changes in isolated consumer behaviours (for example the use of plastic straws) are brought into sharp relief. So too are the limitations of revolutionary approaches that call for plastics to be abandoned altogether. In addition to the risk of perverse outcomes, these approaches elide the complexity of arrangements that underpin the role of plastics in contemporary social and economic life. A socio-technical approach to plastics focuses attention on how diverse and heterogeneous elements can be re-configured (cf. Geels et al., 2015) in support of more sustainable outcomes. In the case of crisp packaging, for example, it is useful to consider how the practice of crisp eating might be configured differently. This might involve a focus on how people access crisps and what kinds of materials and business models underpin this (can crisps move from being a pre-packaged snack to a freshly prepared 'street food' item that consumers scoop into their own reusable containers?), shared understandings of appropriate conduct (including where people eat crisps and how nosily), and product quality standards.

Reconfiguration perspectives on Sustainable Consumption and Production are already gaining traction across a number of policy domains, partly in response to the limitations of orthodox approaches (see Watson et al., 2020). In the case of plastics, there is now a unique opportunity to bypass these limitations and develop practical approaches informed by state-of-the-art research. Beyond simply applying the reconfiguration position as a way to develop more nuanced understandings of plastics in society, our analysis contributes understandings of how these ideas relate to the locus of responsibility for sustainability transitions. Additionally, we note that a focus on plastics brings the importance of genuinely interdisciplinary collaboration firmly into view. For example, the observation that plastic packaging is often comprised of several layers rather than a single material (as per the discussion in the Frito-Lays case) is key to understanding the relational agency of plastics but mostly likely a revelation to many social scientists. In this paper we have necessarily focused on the possible contribution of the social sciences, demonstrating that they have more to offer than insight into consumer behaviour and public acceptability. Nevertheless, we conclude by emphasising (echoing Liboiron, 2016) that the social sciences must pay much greater attention to technical understandings of plastics (indeed, other materials too) if they are to truly understand their place in society and how this might change.

CRedit authorship contribution statement

David M. Evans: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Funding acquisition. **Rorie Parsons:** Investigation, Methodology, Investigation, Writing - original draft, Writing - review & editing. **Peter Jackson:** Investigation, Methodology, Investigation, Writing - original draft, Writing - review & editing. **Sarah Greenwood:** Investigation, Writing - review & editing, Validation. **Anthony Ryan:** Funding acquisition, Validation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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