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Jacob Darwin Hamblin

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Introduction by Jacob Darwin Hamblin, Oregon State University

Do our individual actions to address environmental problems really matter? With repeated failures of diplomats to negotiate meaningful agreements, efforts of businesses to thwart regulations, and the difficulties in making economic plans that include environmental costs, it is no wonder that even the most conscientious people flirt with despair or apathy. And yet individuals do make decisions each day that define their own roles and attitudes toward these challenges. Recycling, with its internationally recognized symbol of green arrows turning in a triangle, has become one of the most common environmental choices that people decide to make.

The meaning of that act is contested. Some see it as pointless, mainly psychological, or worse, that it puts the responsibility on the consumers rather than on industries. Others see it as an important part of each individual's engagement with larger issues facing entire societies. Recycling, for better or for worse, is the most visible connection between environmental challenges and many people's daily lives.

For **Finn Arne Jørgensen** in his *Making a Green Machine*, this "everyday environmentalism" is an ideal opportunity to explore the nexus of environmental history and the history of technology. After all, for millions of people, the main interface in the decision to recycle has been a machine, not the natural world. In Norway, the company Tomra made the reverse-vending machine (RVM) ubiquitous, allowing people to take their old beverage containers back to the shop and cash them in for a small refund. It was enormously successful in Scandinavia, generating extremely high rates of return.

And yet the technology did not catch on everywhere. When the company tried to export it to the United States, it struggled. Jørgensen takes this as an opportunity to explore the importance of technological systems, which require us to look beyond an individual piece of equipment and to take in all that make it possible: business practices, local values and traditions, politics, and the law. As these differ from place to place, we can see how the experience of "everyday environmentalism" changes, too.

I invited **Peter Thorsheim** to contribute to this roundtable because of his past writings about pollution and his current interests in the history of scrap metal recycling in Britain during World War II. He is an associate professor of history at the University of North Carolina in Charlotte. Like Jørgensen, Thorsheim has shown a keen interest in how environmental ideas and motivations differ from one context to the next. In *Inventing Pollution*, Thorsheim explores British industrial history to show how pollution itself was a social construct, and that its meaning clearly changed, especially toward the end of the nineteenth century, due to the prevalence of smoke in major cities such as London. Pollution reversed in meaning over time,

as the supposedly purifying and civilizing actions of humans changed into contaminating, ruinous ones.¹

Heike Weber offers us the insights of a historian of technology. She holds the position of Wissenschaftliche Mitarbeiterin at the Technische Universität in Berlin, and her past work has focused on the history of portable electronics. Her analysis of the standardization of GSM mobile phone technology points to a long-term international negotiation that had more to do with European ideological and economic integration than the mass consumption of cell phones. And yet in time, the priorities of individual users changed a technology into something quite different from the designers' intentions. As her comments in this roundtable attest, she adds here the insights of a scholar trained to think critically about technological systems. Like Jørgensen, she is particularly interested in the fate of consumer items, and her current project analyzes the history of household wastes.²

Tim Cooper also has written about recycling, with a view to understanding its role in reinforcing economic and political relationships. He is a senior lecturer at the University of Exeter, at the campus in Cornwall, England. His analysis of Britain's postwar "waste regime" identifies the economic, political, and ideological elements that made it possible. He observes that environmentalists' and others' criticisms of Britain's "throwaway society" were strong enough in the early 1970s to constitute a serious threat to the status quo, but that technological solutions such as recycling were tools for negating these political inroads.³

Carl A. Zimring has written extensively on the business of recycling. He is an associate professor of Sustainability Studies at Pratt Institute, in New York. His book *Cash for Your Trash* offered a portrait of scrap metal recycling not as an environmental solution but as an industry, one that held a longstanding but under-appreciated role in the American economy. His work is also concerned with specific technologies. In his study of automobile shredding, for example, he confronts a technology that was designed to extend the useful life of iron and steel by reducing old cars into scrap metal. And yet the shredder, perceived at times as an environmental solution, emitted a toxic residue of metal, plastic, rubber, glass, and a smorgasbord of chemicals. These became over time a serious source of industrial waste and pollution, a reminder of the unintended consequences of so-called solutions.⁴

¹ Peter Thorsheim, *Inventing Pollution: Coal, Smoke and Culture in Britain since 1800* (Akron: University of Ohio Press, 2006).

² Heike Weber, "Consumers as Innovative Actors? The Role of Users in the Shaping of German GSM Telephony," *Le Mouvement Social* 228 (2009), 117-130.

³ Timothy Cooper, "War on Waste? The Politics of Waste and Recycling in Post-war Britain, 1950-1975," *Capitalism Nature Socialism* 20:4 (2009), 53-72.

⁴ Carl A. Zimring, *Cash for Your Trash: Scrap Recycling in America* (New Brunswick: Rutgers University Press, 2005); Carl A. Zimring, "The Complex Environmental Legacy of the Automobile Shredder," *Technology and Culture* 52:3 (2011), 523-547.

Before turning to the first set of comments, I would like to pause here and thank all the roundtable participants for taking part. In addition, I would like to remind readers that as an open-access forum, *H-Environment Roundtable Reviews* is available to scholars and non-scholars alike, around the world, free of charge. Please circulate.

Comments by Peter Thorsheim, University of North Carolina at Charlotte

Influenced by the work of Mary Douglas, whose book *Purity and Danger* provides a rich set of insights about the cultural meanings of garbage and pollution, environmental historians have devoted considerable attention to exploring past waste disposal practices. They have asked, in other words, why people have thrown certain things away and how this has affected the environment.⁵ Until recently, however—and despite the emphasis that environmentalists and policymakers have placed in on the “three Rs”—scholars have devoted relatively little attention to asking why people have chosen to reduce, reuse, or recycle.⁶ Central to this issue is the ambivalent status of the materials and artifacts that human beings use: Are these things wastes to be discarded as quickly and easily as possible or resources to be tapped?

Recycling may seem simple enough in the abstract, but as Finn Arne Jørgensen makes abundantly clear in *Making a Green Machine*, the devil is in the details. Building on theoretical approaches developed by the historian of technology Thomas P. Hughes, Jørgensen demonstrates the usefulness of considering the so-called reverse vending machine as the central component of a large technological system.⁷ His fine-grained study shows that reuse and recycling involve complex and historically dynamic interactions between technology, economics, ideology, politics, energy use, natural resources, and environmental concerns.

Jørgensen acknowledges that people recycle for a number of reasons, not all of which derive from an ethic of environmental responsibility. Bottle deposits originated from the beverage industry’s desire to separate the cost of its product from that of the container that held it. Customers who returned their empty bottles were refunded their deposits, which meant that a smaller portion of the purchase price had to be diverted into the cost of the container than if each bottle had been used only once. This lowered the retail price of beer and other bottled beverages and resulted in a larger sales volume and higher profits. At the same time, this system required a major capital investment in the bottles, crates, transportation

⁵ Mary Douglas, *Purity and Danger: An Analysis of Concepts of Pollution and Taboo* (1966); Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (University of Akron Press, 1996); Susan Strasser, *Waste and Want: A Social History of Trash* (Metropolitan Books, 1999); Martin V. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Johns Hopkins University Press, 2000).

⁶ Carl A. Zimring, *Cash for Your Trash: Scrap Recycling in America* (Rutgers University Press, 2005); Zsuzsa Gille, *From the Cult of Waste to the Trash Heap of History: The Politics of Waste in Socialist and Postsocialist Hungary* (Indiana University Press, 2007); Mark Riley, “From Salvage to Recycling: New Agendas or Same Old Rubbish?” *Area* 40, no. 1 (March 2008): 79-89; Tim Cooper, “Modernity and the Politics of Waste in Britain,” in *Nature’s End: History and the Environment*, ed. Sverker Sörlin and Paul Warde (Palgrave Macmillan, 2009), 247-72.

⁷ Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Johns Hopkins University Press, 1983).

infrastructure, warehouses, and bottle-cleaning equipment needed to make the refillable system function.

As a result, refillable glass bottles possessed considerable technological momentum, to use Thomas Hughes's concept, when other types of containers came onto the scene in the 1960s.⁸ Context mattered, however, and for a variety of geographical, economic, and political reasons, this momentum proved particularly strong in Norway. Bottling firms in that country, as Jørgensen notes, had a strong resistance to replacing the refillable glass bottle with a new type of container that would be incompatible with their existing transportation and processing infrastructure—and open them to increased competition from rivals who could forego such investments. For these reasons, these industry insiders referred to bottles and cans made of aluminum, plastic, or thin-walled glass as “disposable” or “one-way” containers. Jørgensen's decision to use the same terminology makes for a somewhat confusing read in places, as such containers could of course be recycled even if they could not be reused in their original form.

The Norwegian policy that privileged refillable glass bottles over recyclable aluminum cans and plastic bottles had as much to do with protecting politically powerful bottling companies and labor unions from foreign competition as it did with protecting the environment. Paradoxically, reusable glass bottles, which long enjoyed a much “greener” image than “disposable” containers, possessed significant environmental drawbacks: they weighed much more than plastic, aluminum, and single-use glass containers. This additional weight meant that they required more energy to be transported than did lighter containers. The process of cleaning and sterilizing reusable bottles required further inputs of energy as well as substantial volumes of water. Furthermore, the waste water from this process was highly caustic.

One of the greatest strengths of Jørgensen's book is his attention to the importance that politics plays in structuring the economic environment, and success, of container deposit programs. Rejecting the naïve assumption that policies ostensibly designed to promote environmental sustainability in fact promote that end, Jørgensen shows that quite different motives have shaped recycling programs. He points out, for example, that when states in the US required consumers to pay deposits on beverage containers, “bottlers wanted recycling to be as inconvenient as possible,” because they were allowed to retain the deposits from people who failed to redeem their containers (90). In Norway and Sweden, however, governments have incentives that rewarded firms when the rate of recycling rose.

Jørgensen's decision to focus on the networked system in which the reverse vending machine is embedded yields many rich insights, but it comes at a price. In

⁸ Thomas P. Hughes, “Technological Momentum,” in Merritt Roe Smith and Leo Marx, eds., *Does Technology Drive History?: The Dilemma of Technological Determinism* (Massachusetts Institute of Technology, 1994), 101–13.

order to tell the story of this remarkable technology from the perspective of the inventors and entrepreneurs who developed it, Jørgensen occasionally seems to imply that high levels of recycling could never have been reached without this machine and the financial incentives that it facilitated. Elsewhere in his book, however, Jørgensen observes that many people, including him, derive satisfaction from participating in recycling because it makes them feel better about their own consumption and their relationship with the environment. In addition to devoting greater attention to explore the role of psychology in shaping people's recycling behavior, it would be worthwhile to examine patterns of disposal involving containers for which no deposit is charged, such as soup cans or shampoo bottles, and to compare the rate at which these artifacts that are recycled in places with and without deposit systems for beverage containers.

Inspired by the example of Kranzberg's "Laws" (posited by Hughes's fellow co-founder of the Society for the History of Technology, the late Melvin Kranzberg),⁹ Jørgensen ends his book by putting forward a number of thought-provoking insights about large-scale systems that he hopes will be considered by "historians looking at business, environment, and technology history": 1) to succeed, both business interests and policy aims must work in concert; 2) businesses can be simultaneously profitable and beneficial to the environment; and 3) environmentalism and other cultural or ideological movements influence technological developments. In sum, he argues that for individuals' "everyday environmental actions" to be effective, our "technological, political, and business structures" must be designed with the environment in mind.

Piloting a middle course between neoliberal calls to lessen environmental regulation in the name of economic prosperity and radical environmentalists' belief that only a wholesale rejection of consumption can make it possible for humanity to survive on this planet, Jørgensen embraces the reverse vending machine as a manifestation of the "everyday environmentalism" that he believes will help to reconcile humanity with the environment.¹⁰ In so doing, he also demonstrates the contributions that historians can make to questions about where we are headed. *Making a Green Machine* demonstrates the value, both to history and policy, of considering technology and the environment interdependently. Although it remains to be seen whether acts of everyday environmentalism, such as recycling empty containers, will be enough to fix the daunting environmental problems that human beings have created, there can be little doubt that they are at the very least necessary steps along the way.

⁹ Melvin Kranzberg, "Technology and History: 'Kranzberg's Laws,'" *Technology and Culture* 27, No. 3 (1986): 544-60.

¹⁰ Here Jørgensen explicitly draws from Michael Bess, *The Light-Green Society: Ecology and Technological Modernity in France, 1960-2000* (University of Chicago Press, 2003).

Comments by Heike Weber, Technische Universität Berlin

In the past couple of years, I have lost track of the bottle deposit system of my home country, Germany. For decades, you paid a deposit for refillable bottles that you then turned back to grocers or beverage stores. One-way bottles lacked any deposit and hence, consumers threw them away or, if glassware, might have carried them to glass recycling containers. These had been set up in the 1970s as a compromise between politics and glass industry to handle one-way glass container waste. In 2003, the deposit system was decoupled from the refilling system and linked up to novel channels of material recycling. In the end, the contentious negotiations on deposit laws have resulted in a babel: in German supermarkets, a one-way bottle filled with juice doesn't carry a deposit; however, if the same bottle is filled with liquids containing carbon dioxide, it will have one. Wine bottles lack refilling options as well as any deposit. In contrast, German breweries still sell most of their beer in the traditional refillable glass bottle. A recent poll demonstrates that I am not alone with my ignorance: every second German citizen has difficulties in discerning a refillable from a one-way bottle. But what is more, due to the long material, cultural and mental persistence of the refillable beer and mineral water bottle, many German consumers wrongly equate recycling to "bottle refilling," whereas in most cases it refers to the material recycling of the packaging after its one-way use.

Seen in this light, Norway realized a rather determined and clear-cut beverage container recycling system, as Finn Arne Jørgensen demonstrates in his book *Making a Green Machine*. Originating in a Ph.D. dissertation at the NTNU, the book's main focus lies on the Norwegian company *Tomra Systems A/S*. Drawing on his expertise as historian of technology and environmental historian, the author informs us about the co-shaping of businesses such as Tomra, of "green" technologies such as recycling infrastructures and the related environmental politics. Tomra was founded in 1972 as a family-business and soon became a leading developer and provider of so-called reverse vending machines (RVMs). As a listed global business group, it presently holds 90% of the global RVM market. Jørgensen's perspective on Tomra and the RVM is well chosen. The RVM not only became the linchpin of Norway's quite distinct recycling system. By now, consumers in nearly any country with mandatory deposit laws use this technology: Once consumers have placed their deposit containers in the machine, or, as Jørgensen phrases it: the "hole in the wall", these are scanned and identified, before the RVM then prints out the receipt to be refunded at the cashier.

The analysis covers the 1960s to 1990s and, geographically, Norway, Sweden and the U.S. Also reaching back to earlier decades, the traditional bottle refill system is described; it persisted in Norway longer than elsewhere since the one-way bottle was heavily taxed after its debut in 1961 and thus practically banned for some time. Indeed, RVMs originated in this traditional refill system. Confronted with the logistic

“bottle-neck” of channeling refillable containers back to the bottlers, grocers set up simple machines that accepted the consumer’s returns bottle by bottle and disgorged a token instead. In late 1960s Norway, over 800 models of such early RVMs were in place. By that time, Norwegian grocers (most of whom favored the one-way bottle) were searching for a better technical solution, since they realized the extent to which the Norwegian government would impede one-way containers. Together with grocers, Tomra developed such a solution in the early 1970s. Jørgensen describes this initial innovation and the subsequent continuous redesign and re-interpretation of the RVM and its meanings that happened after the introduction of new container materials (aluminum, PET plastics), due to an engagement in different national markets and their differences in respect to consumer culture and environmental policies. Sweden and the U.S. were highly relevant for Tomra’s growth and learning. The Swedish Returpack System, founded in the 1980s to reach the state-set recycling quotas of aluminum cans, became Tomra’s entry point into the neighboring market and into the handling of new container materials. In contrast, Tomra’s engagement in the U.S. – the world’s leader in respect to disposable container packaging – became a failure, because in U.S. states with bottle deposit laws, a supporting recycling infrastructure such as Returpack was missing. The last chapters of the book describe how Tomra stretched its field of activity to finally become a company that, next to the sensor-based conveying of material into recycling, offers integrated solutions from collection up to the chemico-technical recycling process.

At first sight a dense company history of roughly 180 pages, Jørgensen’s book offers more than that. Reading the book, I became aware about the centrality of logistics for recycling and the role that high-tech electronics (sensors, data processing, etc.) take in the sorting, transporting, and trading of waste. The initial Tomra RVM model operated with halogen and photocell recognition to be able to discern the standardized eight different bottle models used by Norwegian bottlers. The 1975 model was self-programmable and used novel technologies such as microprocessors, fiber optics and lasers which turned Tomra into the biggest European buyer of Japanese lasers before the advent of the compact disc. Meanwhile, RVMs are embedded in a dense, digital backbone where shops need LAN so that the codes of beverage containers can be checked and so that the collected material can be channeled, controlled and traded. In this respect, Jørgensen’s study indirectly highlights the fact that even domestic waste represents a composite of diverse techno-scientific materials the sorting and recycling of which affords as much technology as producing and distributing them in the first place. Initially, this was displayed in Tomra’s self-perception, as the company defined itself as a high-tech company delivering logistic solutions. Only since the late 1980s when eco-labels and “green products” became popular within “environmental consumerism”, Tomra constructed its RVM as a high-tech, infrastructural AND “green” machine that would facilitate environmental-friendly consumption. “Making a green machine” also meant making the machine discursively green, for instance, when Tomra coined the slogan “Helping the World Recycle” in 1997. But the company was also active in eco-audits or lifecycle assessments of its RVMs, and it was temporarily involved in

the forging of the Norwegian *Resirk* recycling scheme that was initiated as underlying infrastructure for disposable beverage container recycling in the years around 1990.

This leads me to the main impact of *Making a Green Machine*. It analyzes and underlines the entanglements of business, technology, environmental policies, and up to a certain point, also consumers' environmental awareness. Next to Tomra, actors such as bottlers, breweries, beverage container producers, the aluminum industry, grocers, trade unions and advocates against littering are described in respect to their – often ambiguous! – interests, arguments and agency. For instance, Jørgensen follows the complex, tedious and ongoing negotiations that lead to the 1974 Bottle Deposit Act (introducing a deposit for one-way containers) or the founding of Resirk. Together with Susan Strasser's *Waste and Want* (1999), Carl Zimring's *Cash for your Trash* (2005) and Samantha MacBride's more recent *Recycling Reconsidered* (2012), the book demonstrates two important and counterintuitive facts. First, recycling is never simply driven by ecological concerns, but results from negotiations between industrial, economic, social, environmental and moral interests. Likewise, recycling policies are a blend of business interests, national interests, ecological concerns, and culturally engraved consumption morals, to name just a few. The high taxing of disposable containers in 1970s' Norway, for instance, also were a means of protectionism with the aim to save the local beverage industry against global players such as Coca Cola. Second, this scholarship reveals that the history of recycling reaches way back beyond the ecological movement of the 1970s – RVMs, for instance, didn't originate in environmentalism, but in the logistic problem of reverting bottles and Tomra only tardily re-defined itself as "green" company.

Given the book's dense empirical description of actors and interest groups, I found the main claims that Jørgensen makes and the "lessons" to be learned by the readers astonishingly broad and general. The author states that modern environmental policies rely both on business interests and convenient infrastructures since only these – but not environmental laws or law making as such – can translate the "everyday environmentalism" of consumers, e.g. their willingness to recycle, into positive environmental impacts. Hence, businesses play a role as environmentalists. Environmentalism, on the other hand, is not a stagnant but a dynamic concept. Some of these claims are positioned against older narratives of business as well as environmental history that neglected the environmental imprints of businesses or, respectively, followed a declensionist narrative depicting industry and consumerism as natural enemies of the environment. But during the last decade or so, more refined approaches have been developed, and besides, novel disputes on the economy-environment relationship have emerged that could have been related to this case study in a telling way. For instance, what does it teach us in respect to the broad discussion on the prospects and pitfalls of a so-called "green economy"? Or in respect to the "ecological modernization" approach that wishes to re-define industry's role as an antidote to the past ecological devastation caused by it? And what can we learn from the Norwegian recycling case in respect to environmental

governance in general? Jørgensen's book demonstrates how efficient economic incentives – for instance the high Norwegian taxes on disposable containers – can be for the implementation of environmental policies. Since he analyzes one of these newly “greened” players, his insights might help to carve out a more detailed framing of the industry-environment-politics relation. Furthermore, after two to three decades of businesses, consumers and policies turning “green”, not too many academics seriously question the need for green businesses to “help the world recycle”, accepted that we stick to our present forms of society, production and consumption. But this historical experience has resulted in a situation where more complex questions and novel historical tasks have come to the fore. Indeed, we need to control, measure, and somehow evaluate the different shades of “greenness” at play, and the historical process of a gradual “greening” of different players should prompt historians to critically reflect on what is constructed as green.

Jørgensen's perspective on Tomra and the RVA merges environmental, technological and business history. It uncovers how Tomra interacted with different recycling regimes and sometimes even shaped them. Inside this story, the author refers to many important issues that might have exceeded the scope of the chosen perspective, but that would be promising issues for future research. I will briefly discuss three potential axes. First, the question about what happens “behind the hole in the wall;” second, the wider cultural and social history of consuming and recycling and connected to this, Norway's exceptionality in pioneering recycling; and third, the question whether recycling is just a matter of a convenient “technological fix” or a novel kind of symbolic exchange system.

In Norway, the RVM turned into an “obligatory point of passage” that beverage containers have to enter for their recycling. While Jørgensen borrows this metaphor from Bruno Latour, he does not follow the potential paths that Latour could have inspired: the networks, transmissions, or delegations of social relations to technology. For consumers, the streams and transformations going on “behind the hole in the wall” – e.g. who refills or recycles what quantities of bottles or cans with what aim – stay obscure, and the same is true for the book. To uncover the messy and ramified streams that beverage containers take between return and final refill, reprocessing or even disposal, is a hard nut to crack. How many containers go into the RVM, how many are wasted so that industry makes a profit from non-refunded deposits while municipalities will pay for the disposal? And what happens to other containers such as glass food packaging or food cans? Likewise hard to tackle is the question about the degree to which past recycling was actually “green”, in particular in respect to alternative roads not taken or in respect to the ecological imprints of the different beverage containers involved. Recycling-minded German consumers, for instance, regularly demand sophisticated life cycle assessments of different container packaging, and, at the same time, there is an indestructible cultural tendency to “believe” that the refillable glass bottle is the only deep green packaging. Critical consumers will eventually ask about what is going on behind the wall and historians might help to answer the question why societies appropriated certain materials for packaging in the first place.

Jørgensen makes clear that wasting and reusing are influenced by cultural mores and mentalities. For instance, he refers to a “traditional, sober Norwegian mentality” (p. 12) that in the 1960s saw itself threatened by both the Swedish and the American style of consumerism. When confronted with the first one-way glass bottles in the early 1960s, many Norwegians were alienated or even irritated that they should have to buy a container that would be thrown away, and the same probably could be stated for other European consumers. Two facts are most remarkable to non-Norwegian readers. For one, the relationship between consumers, grocers, brewers and distributors was enormously cooperative in the Norwegian context. For another, the plastic bottle came into play in Norway only in the mid-80s, and by then had only reached a market share of 10% inside soda bottling due to high environmental taxing. This singular path assuredly has much to do with the described cooperative atmosphere of the Norwegian welfare state in combination with a “moral, ascetic approach to consumption” (p. 26) that managed to hold down the glass and later the plastic one-way bottle, at times by voluntary agreements on the side of the industry, at times by national taxes, and at other times by deposit laws. As a consequence, in the late 20th century, the Norwegian recycling of disposable containers was integrated into the existing recycling infrastructure for refillable bottles at the heart of which lay the RVM. Hence, for Norway, indeed, the RVM became “the glue that keeps the entire beverage-container recycling infrastructure together” (p. 143), but this is not true for the also quite high recycling rates in Germany, as the introductory sketch underlines. Jørgensen already gives us much to think about Norwegian, Swedish and American differences in recycling and it would be promising to enlarge this comparative approach into a wider analysis on American and European paths into different forms of “throwaway societies”. More research on this would compliment our knowledge about the differing American and European paths into mass consumption societies that social and consumer history has compiled so far without ever including waste and recycling.

The obvious difference between Norway and Germany in their recycling infrastructures – the simple RVM-based scheme versus the complex thicket of multiple channels (traditional refill system, RVM-based recycling of deposit containers, and voluntary glass recycling next to the “Green Dot” packaging recycling) – leads me to a final question, namely whether recycling is really just a matter of the appropriate “technological fix” as the author suggests. Jørgensen argues that recycling needs to be convenient and claims that the RVM is such a convenient fix. But the German recycling quotas are also quite high and so is the citizens’ willingness to recycle. At the same time, seen from the point of consumers, one might ask whether carrying bottles back to shopping points is convenient at all. Feminist scholars have uncovered the domestic sorting, storing, and recycling of waste as unpaid work mostly pursued by women, and one could even question whether consumers should do this job instead of industry with its better product knowledge. Indeed, consumers seem to put up with obstacles and extra hurdles as long as they have the feeling to do something good for the environment. Hence,

convenience has to go along with an emotional connection to morals and novel identity as consumer-recycler-citizen. As the author states himself, the RVM “absolves consumers of any environmental sins” (139). I wondered how anthropologists such as Mary Douglas (who reasoned on dirt and waste as matter out of place), or semioticians and poststructuralists such as Barthes and Baudrillard would have described the RVM. As a historian, I see parallels to an important religious, historical institution, namely the confessional box. Both the RVM and the confessional box seem to adopt similar symbolic functions for the moral economy of past and contemporary people respectively. With a guilty conscience, you turn in your undesirable sins, being aware of the fact that you have behaved against better knowledge or morality. While it stays obscure what is going on behind the curtain (you don’t have to care about this or don’t have the knowledge to do so), you hand over your personal responsibility to this distant realm. In return, you receive an absolution for your ongoing guilt in your daily realm of life. To my mind, we can only fully understand recycling once we respect such moral economies at play next to the political, economic, technological, and ecological issues at stake.

Comments by Tim Cooper, University of Exeter, Cornwall Campus

Finn Arne Jørgensen's *Making Green Machine: The Infrastructure of Beverage Container Recycling* joins a growing list of recent works in the field of environmental history that are broadly sympathetic to the market and private enterprise as sources of positive environmental change. One might count it alongside Winter's *Secure from Rash Assault*; Carl Zimring's, *Cash for your Trash*, T.C. Smout's recent collection *Exploring Environmental History*, and the work of Canadian geographer, Philippe Desrochers, on Victorian recycling, as representing a 'revisionist' trend that is sceptical of wide-ranging claims that industrial capitalism is at the root of environmental evils. *Making a Green Machine* is also clearly intended to influence environmental policy, a move that is increasingly common among environmental historians keen to demonstrate the social relevance of their sub-discipline. Jørgensen seeks to demonstrate the efficiency of the free market in developing environmental technologies, and the need for a public policy that is sympathetic to free-market entrepreneurship. As such, *Making a Green Machine* must be read as more than a simple business history. Rather, it should be read as a political and ideological intervention.

For those, such as me, who approach these questions from an eco-socialist point of view, and who therefore view capitalism as *the* key obstacle to effective political action on ecological issues, *Making a Green Machine* represents part of an alarming trend away from a critically engaged environmental history. It is an ideological text. I mean this in the double sense that it both propounds a line sympathetic to capitalist development, and that it is also often unconscious of its being rooted in ideology. This is most obvious in the uncritical normative basis upon which many of the books fundamental judgments and policy recommendations are founded. Jørgensen dismisses, for example, "environmental philosophies like Arne Naess's deep ecology," for ultimately having their roots in what he terms "utopianism." Such utopias are, we are assured, unachievable "this side of enlightened world dictatorship." In one simple move, Jørgensen raises the spectre of totalitarianism in order to delegitimize any claim for fundamental change in the social relation to nature.

While such a position clearly makes a mockery of the real complexity of green politics, and the varied ways in which it actually operates throughout the political spectrum, the move of effacing politics is actually central to the ideological character of Jørgensen's book. *Making a Green Machine* represents some of the most dangerous tendencies in a post-political historiography that seek to present the market as the source of 'realistic' and 'practical' solutions to environmental issues. The possibility that revolutionary change may be the only 'realistic' option for action on ecological questions is never countenanced. This is embedded in Jørgensen's text even at the level of scale. The micro-level analysis of the glass bottle, the reverse vending machine and the history of an individual enterprise, attenuates the global

character of environmental issues. There is no space here for such obvious questions as whether or not a capitalist social metabolism predicated on permanent compound growth can be in any way mitigated by recycling technologies. The insights of ecological economics into the limitations of recycling in an expansive system are nowhere discussed by Jørgensen, even though the assumption that recycling is an effective form of 'everyday environmentalism' provides the absolutely fundamental condition of possibility for his claims. The absence of a global perspective on the capitalist metabolism, such as provided by ecological Marxists such as John Bellamy Foster or Brett Clark, is an absolutely fundamental flaw in the central claims of the book. There is not even an attempt to critically analyse the ecological footprint of reverse vending and glass-bottle recycling, though surely this must be key to establishing its environmental credentials. Instead it is simply assumed that such systems deliver the environmental goods.

Against the chimera of deep ecology Jørgensen poses the concept of "everyday environmentalism," the set of embodied practices, such as recycling, that enable the "consumer" to participate in environmental change. It is into this space that the entrepreneur (in this case the founders of the Tomra reverse vending machines) can fit in providing the technologies that make everyday environmentalism work. These are the heroes of Jørgensen's narrative who demonstrate the "role of business and technology in promoting environmental goals". There is something very tempting about this picture of the simple, everyday market-provision of the possibility to participate in environmentalism, and the idea of simply driving to the supermarket to participate in a ritualised green consumerism. All of this points to some very mainstream critical literature on green-washing. Jørgensen never engages with any of these possible criticisms of the Tomra RVM system. As such *Making A Green Machine* remains ideologically blinded to the most basic political move of such a technology, its capacity to generalise a social problem and to render it a problem for individuals.

All this raises the question of whether another interpretation of Jørgensen's data is possible here that produces a slightly less sanguine approach to the capitalist relation to nature. First it is notable how divergent the process application of the RVM was. In European states such as Sweden and France the RVM fit closely with the interest of bottle manufacturers, distribution networks and the legislative framework that underpinned glass bottle recycling. Barring the few US states with appropriate legislative contexts, the RVM failed to make much of an impact in the US, and indeed almost undermined the Tomra company altogether. Tomra's breakthrough into the US market was stymied by corporate interests' successful opposition to Bottle Bills. Its failure prompted the professionalization of Tomra company marketing, and the relative marginalisation of the inventor-entrepreneurs that had driven the company since its birth. The close alliance between corporate interests and legislative influence here goes uncommented by Jørgensen, but from a Marxist perspective would seem to cry out the fundamental limits of state capitalism in promoting socially necessary ends. Here Jørgensen comes up across the limits posed by his normative post-political assumptions. It was precisely the capacity of

companies to mobilise political power that determined the success or otherwise of the RVM technology. Everyday environmentalism is thus rendered contingent upon the structural conditions within which markets for recycled products are legislatively and economically constructed. Such an example cries out the limitations to free-market solutions to environmental problems, but goes unremarked by Jørgensen, whose suggested solution to such problems appears to be limited to the requirement for companies to better organise cartels to manage politics through lobbying and collaborative techniques. Tomra's choice to engage in the Resirk consortium, for example, was a result of its recognition that it needed to keep "a close eye on the world of politics, as it was here that the potential for its machines was decided." Apparently there is no contradiction between the exercise of corporate political influence and the ban Jørgensen places upon "utopian" political projects."

Similarly, we can re-read, Jørgensen's account of the greening of the RVM. Again, the fact that this technology began not as an environmental intervention, but as a practical solution to Swedish shopkeepers' needs to keep tidy storage-rooms is underplayed. The technology only became explicitly 'green' after the disaster of Tomra's failed entry to the US market. Professionalised marketing deployed environmentalism as a new mode of marketing an old product. Jørgensen, can even precisely date the emergence of Tomra as a green company to 1989. Such facts stand uncomfortably alongside the entire premise of *Making a Green Machine* that small entrepreneurial activity develops the infrastructure of everyday environmentalism. Not only are the 'green' credentials of the RVM never established, but it is apparent that even its green identity is a post-facto, subjective creation of a company marketing strategy. This, and the development of corporate environmental impact analysis, is never subjected to critical analysis by Jørgensen.

Making a Green Machine represents a very problematic move in contemporary environmental history. At just the point that global ecological problems such as climate change begin to represent existential social problems, environmental history is turning away from critical engagement with its subject matter. *Making a Green Machine* sets out a narrative that explicitly seeks to undermine the prospects for a revolutionary political intervention into this issue. It demonstrates the limits of a post-political environmental history driven by the desire to demonstrate its pragmatism and relevance in the terms that serve elites rather than global citizens. Yet, even on its own terms it fails to establish its claims for the effectiveness of market-driven, technological, everyday environmentalism. It is worth asking, then, whether environmental history should take much more seriously the possibility that our ecological crisis demands a political intervention, and whether the social constellation that can deliver solutions to problems such as climate changes can exist only outside the co-ordinates of capitalist social organisation. This too is a political and ideological question, but it is one conscious of its own ends and responsibilities. In the face of anthropogenic climate change, we are perhaps now required to get really serious. We need to look beyond the short-termism of the desire to influence policy and generate 'impact' in a social system that cannot be

reconciled to social and environmental needs. Instead we need to build historical narratives and critical analysis that opens up the possibilities for thinking the revolutionary change that is the only realistic basis for social and environmental justice. Ultimately, and ironically, *Making a Green Machine* is fatally limited by its refusal to recognise the flawed utopianism of its own pragmatic project.

Comments by Carl A. Zimring, Pratt Institute

The subject of *Making a Green Machine* would, at first glance, seem unduly narrow to interest many environmental historians. A library patron in the United States stumbling upon a history of reverse vending machines in Norway might assume that the book would be one of the more narrow and insular topics in the history of technology, and of limited interest to environmentalists (or, for that matter, Americans).

That impression could not be more incorrect. Finn Arne Jørgensen has written a delightfully accessible history of recycling that will make readings consider how this one technology shapes (and is shaped by) patterns of consumption and waste in both Europe and the United States. The introduction grounds the study in a global comparative framework of waste management and consumption both past and present, allowing Jørgensen to then introduce his readers to Scandinavian developments. As an example of comparative history for the late twentieth century, it is a model, showing the parallels between Norwegian legislation and industrial developments with American ones.

Jørgensen globalizes his study from the start, comparing treatment of beverage containers in four 21st century cities: Beijing, New York City, Charlottesville, Virginia, and Trondheim, Norway. From there, he relates how complex the seemingly innocuous cans and bottles we use for beverages are to develop, consume and manage in a system of material flows involving many people and institutions. He ably contextualizes the environmental politics of the 1960s through the 1990s, drawing parallels between developments on both sides of the Atlantic. This context then allows the reader to be introduced to the case study at hand without it seeming insular.

Jørgensen describes the reverse vending machine's development in Norway using an impressive array of legislative records, corporate records, correspondence, and interviews with the subjects. While I am no expert in Scandinavian political history, the rich detail on changing environmental policies is – along with the accessible focus – a strength of the book.

This is a first-rate history that has an obvious audience in scholars of the relationship between technology and the environment; it should also appeal to policymakers and activists concerned with waste management in any industrialized nation. *Making a Green Machine* is not the only book to consider trans-Atlantic patterns of developing sanitation and consumption systems (studies ranging from Joel Tarr and Gabriel Dupuy's *Rise of the Networked City* to Martin Melosi's discussion of Edwin Chadwick's influence on American sanitary engineers in *The Sanitary City* are important precedents), but the compact framework is one that

would work to place almost any industrialized nation's consumption of beverage containers into the world economy.

My hope is that in the years ahead, the concise yet rich treatment of Scandinavian recycling in this book serves as a model for studies of other industrialized nations. As such, it leads me to a few questions about how this work relates to both the past and present states of recycling in the industrialized world. Since 2008, the economic downturns in the EU and worldwide have had broad effects on commodity prices, including aluminum and steel. While nations such as the Netherlands have instituted zero waste policies that would seem to encourage the use of reverse vending machines, is low demand for collected materials a problem for this device? To what extent is the collection of cans and bottles in Scandinavian countries affected by the volatile global market for secondary commodities? Have RVMs recouped their purchase and maintenance expenses, even in times of depressed markets?

A second set of questions relates to issues of culture and education. Recycling is both an economic activity and a practice that requires both faith and education to be done correctly. Faith, in that the people who sort and return their recyclables have sufficient faith that these materials are going to be recycled rather than landfilled. Education, in that the public and private interests invested in recycling have to provide consumers some level of guidance as to what to recycle and how to recycle.

We have several examples of communities successfully adapting to the reverse vending machine. When I lived in Michigan (a state which has a deposit charge on beverage containers), I used to go to the local market on Sunday mornings and watch with amusement as the hungover fraternity brothers wheeled shopping carts full of empty beer cans into the store to return them, one by one, in the reverse vending machine. An established culture of recycling – in no small part shaped by the deposit fee – ensured these young resource recovery specialists would carefully follow instructions despite their aching heads. Successful completion of the task would eventually reward them with money to, perhaps, purchase more beer at that very market, cycling their money, the alcohol, and the containers. Other, more temperate members of the community also were regular recyclers at the store, testament to a culture that valued the activity and was well-versed in the correct use of the RVM.

The context differs in other areas. Chicago, for example, has a poor history of recycling, including expensive, infrequently-used curbside pickup programs, ineffective ordinances, and little education of the community by public or private interests invested in recycling. Those residents who are interested in recycling have a high degree of cynicism that collection efforts are actually diverting materials from landfills. Earlier this year, the James Thompson Center (housing many offices of the State of Illinois and a heavily-used building in downtown Chicago) received its first reverse vending machine to great fanfare and news coverage. Yet after the opening week, little attention has been paid to it, and it runs the risk of becoming yet another

ineffective chapter in the city's history of recycling. I am unaware of educational efforts being made to reach out to consumers using the Thompson Center's RVM. For all many in the building are aware, this receptacle is little different from the plastic or metal bins where they might place their cans, bottles, or (incorrectly) food waste, soiled paperstock, and other materials that will not be recycled by the entities collecting the contents of the bins.

I tell this story because of Chicago's culture of recycling. In a community with little education about recycling and attitudes toward recycling that range from cynicism to indifference, how effective can this machine be? What are the opportunities and limitations of technologies such as the reverse vending machine to change the cultures of consumption and disposal we associate with beverage containers? Jørgensen's chapter "Can Cultures" – especially when he discusses adapting policies to improve rural recycling rates – speaks to this question, but it is worth drawing out for both the recent period and in a more comparative discussion.

While Chicago's experiences may be unusually problematic, a troubling global trend in beverage consumption in the early 21st century involves the evolving materials that the RVM might serve to collect, namely the worldwide embrace of disposable plastic water bottles. While Jørgensen certainly discusses plastic bottles as containers the RVM handles, he does not discuss the significant growth of this particular type of container throughout the industrialized world (and, I presume, in Scandinavian countries). I wonder if Jørgensen would like to comment on how this heightened cultural preference for convenience and disposability can be mitigated through technological innovation. Does a reverse vending machine encourage the production of particular kinds of containers at the expense of others? Does it offer a false sense of environmental security to consumers who purchase these beverages? How does this technology shape the dynamic history of the specific materials used in cans and bottles? How might it help us develop more sustainable forms of recycling in the future, be it in Norway, New York, or Nigeria? Is the RVM providing false hope that the millions of new plastic beverage containers sold worldwide will be returned to industrial production rather than spreading into the oceans and piling high in landfills? How might this machine affect the composition of packaging materials in the future?

It is a credit to this book that it inspires these questions, and I look forward to the conversation it creates.

Author's Response by Finn Arne Jørgensen, Umeå University

Fifty Shades of Green

Let me open my response by saying that I'm grateful to all four reviewers for taking the time and effort to contribute with this set of diverging – and thus interesting – reviews. Jake Hamblin also deserves thanks for organizing the roundtable and for fostering the kind of dialogue and exchange that the roundtable reviews enable.

Both the supportive statements and the sharp criticism in the reviewers' comments open up some important areas of discussion. Tim Cooper in particular puts sharply into relief some of the larger issues of framing in environmental history (and other disciplines) that we are faced with. I fully agree with his observation that there seems to be a shift going on in environmental history at the moment, but I'm much more enthusiastic about the character of this movement. I will return to this point, but first I briefly want to discuss the stakes at hand.

The topic of my book can – as several of the reviewers observe – seem trivial at first: how have people recycled their bottles and cans since the 1960s. However, I would argue that it is anything but. Based on an empirical study of the reverse vending machine as a technology and its gradual embedding into increasingly larger sociotechnical systems set up to enable consumer recycling, I discuss the ways in which ordinary people in their everyday lives engage in acts of what may or may not be called environmentalism. Rather than take environmentalism and greenness as something granted and absolute, I explore how the actions of a number of actors contribute to making many shades of green. Importantly, the development of the recycling infrastructures I discuss has not been primarily driven by the traditional environmentalist actors that we know well from the extensive histories of environmentalism and activism.

Many of these histories have focused on what I (admittedly somewhat clumsily) called utopian or dark green ideals, which certainly have an important role to play in the larger picture, but in my book I was more interested in the everyday, lived experiences of environmentalist practices and how they interlock with larger technical infrastructures. I have called this everyday environmentalism, but I will note did not make up the idea of everyday environmentalism, nor am I the only one to have used it.¹¹ Within the scope of this study, I did not see it as my goal to promote or condemn particular lifestyles, but rather to understand modern recycling practices in an infrastructural framework. My relationship to everyday environmentalism is somewhat ambivalent, though I wished to challenge the notion

¹¹ Several other books have used "everyday environmentalism" as their title recently. Jason B. Czarnezki, *Everyday Environmentalism: Law, Nature, and Individual Behavior* (Washington D.C.: Island Press/Environmental Law Institute, 2011); Alex Loftus, *Everyday Environmentalism: Creating an Urban Political Ecology* (Minneapolis: University of Minnesota Press, 2012).

of small actions as isolated and insignificant actions. Instead, I explored the role in technological systems in tying them together. My interest was in exploring the ways business interests get involved in these actions. Furthermore, the ways in which these systems and the actions they enable emerge are not accidental.

Over time, the actions and interests of actors become embedded in institutions, in technologies, in ways of thinking. Particular logics, such as the market logic, becomes seen as “better” than others, in part because they “fit” better with the rest of the system. My understanding here is of course shaped by the historian of technology Thomas P. Hughes, as well as other scholars within Science and Technology Studies (STS); such systems are socially (and historically) constructed, and are simultaneously shapers of society. Technological systems give direction to history and to our societies, but not in predetermined ways. They also change over time, and I believe it is important to study how such change happens. In short, technological systems are full of economy, culture, science, and politics, and this is why I argue that environmental historians – and activists – need to pay heed to the technological systems we are part of, whether we like them or not.

In his critical review, it seems to me that Cooper suggests that “green” is something absolute, an unchanging dark hue with particular characteristics, that stands in opposition to so-called green consumerism, and that can only conclude with the complete rejection of any business initiative. The green identity that Tomra’s reverse vending machine gradually develops is, in his interpretation, a “post-facto, subjective creation of a company marketing strategy”, and thus not real. I disagree with such an interpretation, and in fact, one of the questions I discuss in the book is how one can establish “green” credentials, whether one is a machine, a company, an organization, or an individual.

There are many shades of green; “the environment” is not one thing. The first environmentalist debates around beverage containers were centered on local littering, whereas they have become more abstract today, focusing on global resources, global climate change, and to some degree environmental justice. The black and white binary of beverage containers as thrown away or returned no longer exists. While Tomra officially embraced environmentalism in 1989, in an undoubtedly opportunistic (and successful) attempt to align itself with the green wave of environmentalism at the time, the company – and the individuals operating within the company - had been in an unofficial dialogue with environmental concerns since the very beginning, as I discuss throughout the entire book.

Does recycling matter?

Another set of questions circle around issue of recycling and what its “real” effect is. Should I have attempted to measure the actual effectiveness of beverage container recycling, and if so, how would I go about doing such a thing? Weber suggests that I ultimately argue that effective recycling is simply a question of an effective “technological fix.” Cooper goes one step further and asks what the point of

recycling is altogether? Does recycling, in the end, come down to the question of “the capitalist relation to nature”? Can recycling technologies mitigate the effects of “a capitalist social metabolism predicated on permanent compound growth”? Is recycling simply greenwashing, where bottle recycling cleans our conscience and makes us feel we are doing something for the environment? What is the real ecological footprint of beverage container use and recycling?

I do not attempt to analyze the ecological footprint of reverse vending and glass-bottle recycling, for a number of reasons. The answer to this question is as hard to find as “objective” history. First, you need to know what it is you want to measure. Second, you need to define the boundaries of what you measure. So this also becomes a question of framing. In the Resirk debate I analyze in my book, I show how exactly these questions, framed as life-cycle analyses and other methods from industrial ecology became a battleground for both sides of the debate, and the results derived from these methods came to equally support both standpoints. I find much more interesting the ways in which these questions were framed and how they helped establish “the greenness” of disposable aluminum containers as a boundary object that both sides could engage each other around, all while more or less circumventing and under-communicating a number of other agendas related to labor interests and trade protection.

Carl Zimring asks a good question about the massive rise in disposable plastic water bottles, which an increasing number of scholars have examined in the last few years.¹² I can understand the attraction of bottled water in places where the tap water is unsafe or just tastes chemical and treated. In Scandinavia, however, we generally have fantastic tap water, but bottled water is still amazingly popular. Most explanations tie its popularity to mobility; water on the go is a great idea, and it is also a compelling and healthier alternative to carbonated and flavored corn syrup beverages. The sense of environmental security bottled waters offers is usually not false, but there are also costs, as Andrew Szasz demonstrates in his study of “inverted quarantines,” not to mention studies of the fights over access to water resources.¹³

One of the key technological innovations that have enabled this development is the way bottlers have moved from using reusable bottles to increasingly thinner and lighter bottles. The thin PET bottles that are so ubiquitous today are indeed problematic, even when collected, since there are such limited uses for them. Close cooperation on the industrial design side holds one potential key to improvement, in designing products from the recycled material. My office chair, for instance, uses

¹² Francis H. Chapelle, *Wellsprings: A Natural History of Bottled Spring Waters* (New Brunswick, NJ: Rutgers University Press, 2005); Peter H. Gleick, *Bottled and Sold: The Story Behind Our Obsession with Bottled Water* (Washington, DC: Island Press, 2011); Elizabeth Royte, *Bottlemania: Big Business, Local Springs, and the Battle Over America's Drinking Water* (New York: Bloomsbury, 2009).

¹³ Andrew Szasz, *Shopping Our Way to Safety: How We Changed from Protecting the Environment to Protecting Ourselves* (Minneapolis: University of Minnesota Press, 2007); Vandana Shiva, *Water Wars: Privatization, Pollution, and Profit* (Cambridge, MA: South End Press, 2002).

some material from recycled PET bottles.¹⁴ On the other hand, recycling is actually a somewhat misleading term; we are most often talking about downcycling, the conversion to lower quality materials. Aluminum is technically a better product for recycling than plastic is, since it doesn't necessarily degrade to lower qualities. The energy cost involved in aluminum recycling is also relatively low, especially compared to the production of virgin material. The RVM can potentially obscure the implications of the material conversions that take place behind the hole in the wall, and my chapter on how disposable containers became redefined as environmentally friendly explores the idea of the RVM as absolver of environmental sins.

Heike Weber's questions about the recycling of other types of packaging are important, and I have explored these in a forthcoming article where I delve deeper into the mechanisms of recycling.¹⁵ In Scandinavia, voluntary glass, paper, and plastic recycling is relatively high. The question I asked here is not why we recycle, but *how* we recycle. I believe we need to start at this point to find out why Norwegians are such dedicated folders of empty milk and juice cartons, for instance. This may sound bizarre, but one of the reasons why Norway has such a high recycling rate for empty beverage cartons is a lottery. Fold six or more cartons, stuff them inside another carton, write your name and phone number on it, and return it with the rest of your paper waste. Every year, 120 people win 10,000 kroner and four win 100,000 kroner (respectively \$1,800 and \$18,000). Combined with what we know about the effectiveness of the bottle deposit, it is pretty clear to me that the motivations for beverage container recycling are as much economic as environmental. Furthermore, bottle materials have affordances that are closely tied to economic models. As Zimring points out, global demand goes down when commodity prices are low. Reusable glass bottles only make economic sense when short-traveled. I admit to a certain feeling of unease when enjoying an imported microbrew in a classic brown bottle – they are not part of the deposit system. I return them with the rest of my glass containers (separated by color) in the recycling stations that Heike Weber inquires about. These bottles will not be reused, but rather crushed into cullet, melted, and turned into new glass.

Weber also argues that I do not follow Latour's metaphor of obligatory points of passage completely, by not looking at networks, transmissions, or delegations of social relationships to technology. I certainly do the last bit, but it's true that I have not attempted to make a "real" measure of what "actually" goes on, which may be one reason why Cooper took such a distaste to my approach. For me, this comes back to the idea of life-cycle analyses – where do we begin and where do we stop? How do we frame our inquiries into anything? I could have more explicitly challenged the idea of the closed loop, since we can clearly see that it is anything

¹⁴ The Norwegian company Håg has added several such chairs to their product line. My Håg Capisco chair, designed by Peter Opsvik, comes with a full ISO 14025-compliant environmental declaration.

¹⁵ Finn Arne Jørgensen, "The Backbone of Everyday Environmentalism: Cultural Scripting and Technological Systems," in Dolly Jørgensen, Finn Arne Jørgensen, and Sara B. Pritchard, eds., *New Natures: Joining Environmental History with Science and Technology Studies* (Pittsburgh: University of Pittsburgh Press, 2013).

but. There are some metaphors at work that shape our understandings of what is going on – “waste stream” is another. Materials and cultural ideas are so closely intertwined that it can be hard to measure the real impact. This doesn’t mean that we don’t need to pay attention to logistics, though. As Weber points out, I pay close attention to logistics, and I argue that values are not enough for effective recycling. Zimring points out faith and education as two other key factors that support recycling practices. I would go one step further, even: I don’t believe that the problem is that we lack knowledge about environmental problems, but rather that people don’t know how to translate this knowledge into concrete and meaningful actions.

Only at this level can we meaningfully discuss whether recycling matters or not. Beverage container recycling is not a panacea that will solve all environmental problems in the world. It might also be the case that the feeling of doing something for the environment that people get from returning bottles and cans is enough to keep many from making more drastic lifestyle changes. But it could equally well be that making environmental values actionable inspires further action for many.

Business and the many shades of green politics

I had explicitly placed the book at the intersection of history of technology, environment, and business. Historians have to a little degree examined the role of businesses in environmental action, instead often featuring environmentalists and NGOs as protagonists and relegating business actors to adversarial roles. In my book, I aimed to move beyond such stories, showing that a whole range of business, political, and organizational actors are involved in the debates, and their motivations are legion. Most importantly, these actors can have more than one motivation at the same time; environmental concerns, labor concerns, and desire for profit are layered for many actors. Some are relatively benevolent, while others are clearly more interested in profits and market shares than the environmental impact of their actions.

If we move beyond simple generalizations of business environmentalism as ‘greenwashing’, we see many different nuances of green. I think my main problem with Cooper’s critique of my approach is that he assumes ‘Business’ is one monolithic entity that can only engage in environmental debates with the intent of greenwashing. I demonstrate several cases of greenwashing in the book, especially when I discuss the history of Keep America Beautiful, but also and in more complex ways in my discussion of Resirk. At the same time, I believe my story of Tomra’s involvement in developing technologies to facilitate recycling shows that a company that provides solutions to environmental problems is not necessarily greenwashing; environmental action need not exclude economic gain.

Capitalism, in the sense that Cooper uses the term, is to me a very abstract phenomenon. All markets are not created equal, and my book is certainly not about “free” markets. The Norwegian beverage container recycling system is maintained

through political intervention, based on different types of motivations. I wanted to understand the mechanics of how this process worked. I believe that the RVM story demonstrates the value in empirically studying the meeting between abstract phenomena like capitalism, concrete technologies, and local places. Thorsheim, Zimring, and Weber all bring up comparisons to other countries in their reviews. How does bottle recycling travel? A key part of my book is dedicated to discussions of what happens when the RVM enters into new contexts. This point about travel is critical to understand global developments, and to avoid deterministic ideas about the effects of technology. For instance, Weber points out the complexities involved in setting up a bottle deposit system, referring to the extended German debates that left everyone somewhat confused.

I am in no way making a mockery of the complexities of green politics, nor am I uncritically promoting market solutions to environmental problems. I am concerned with where particular forms of environmental action are taking place at the moment, including the market, with a variety of commercial and non-commercial actors. I see the politics in my book as distributed throughout a series of arenas, embedded in machines, laws, organizations, and yes, the market. This is far from post-political. This makes me confused about Cooper's claims that I do not consider the alliances between political and commercial actors, as this is one of my main arguments about the development, success, and failures of recycling systems.

I don't believe blanket criticism of capitalism or a total rejection of the environmental work of commercial actors is sufficient for environmental historians today. My approach of examining businesses and the people behind them in the environmental story, as well as the work of others like Carl Zimring, *is* a revised approach to environmental history—and one I think more scholars need to embrace. Warning stories should be paired with examples of things that have worked when other people dealt with the same problems, while acknowledging the limitations in translating and moving solutions to other places. We need to challenge ideas of determinism, whether it is social, technological, environmental, or economic. Environmentalism comes in many shades.

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