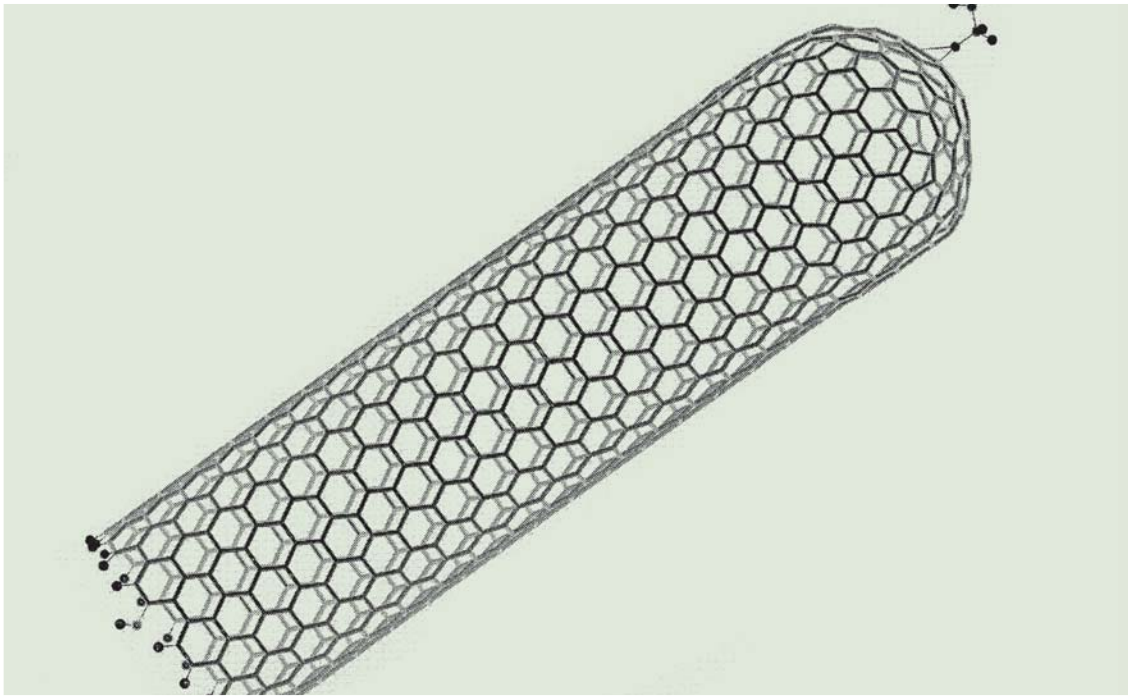
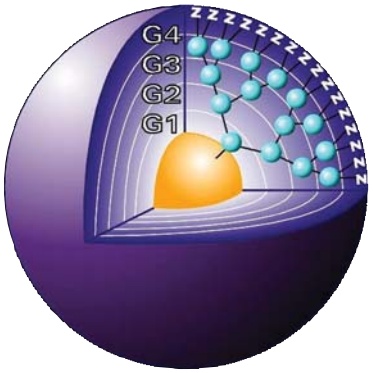
Studies in Materials Innovation

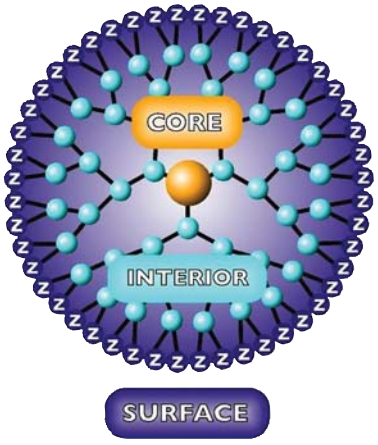
Center for Contemporary History and Policy

Sun & Earth and the "Green Economy":
A Case Study in Small-Business Innovation

Kristoffer Whitney







Chemical Heritage Foundation

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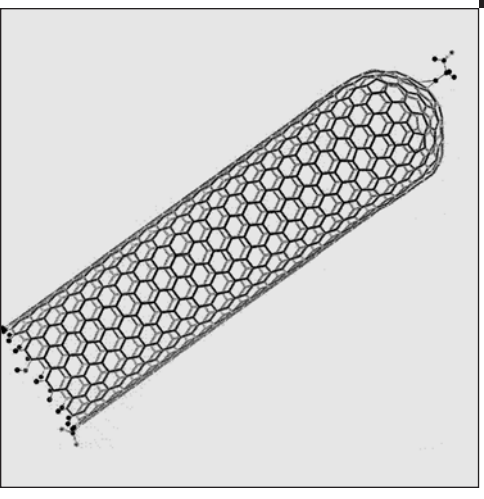

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CONTENTS

I. INTRODUCTION AND SUMMARY

Since 1980 the household-cleaning-products industry has proliferated with small, niche firms catering to consumers interested in plant-based surfactants, or oleochemicals, rather than mainstream petroleum-based cleaners. While oleochemicals are still a relatively small part of the market, a few highly successful firms have not only inspired other similar small businesses but have also led large, mainstream producers to innovate their own lines of "green" household products.[1] This case study focuses on one of the earliest companies to produce "natural" household-cleaning products, Sun & Earth, and places the company in the context of the larger phenomenon of the so-called green economy. The case of Sun & Earth illuminates what it means to innovate as a small business in a niche market. The role of Sun & Earth–type firms has been to serve as focal points and outlets for specialty components produced elsewhere rather than to focus on the development of a particular compound, chemical, or product through an intensive R&D effort. The role of Sun & Earth specifically is to adopt and adapt plant-based surfactants into a branded, holistic product that appeals to a range of consumers interested in what are loosely identified as "natural" cleaning products.[2] The story of this firm suggests that for companies selling their products as both material goods and a set of ethical values, the source (i.e., feedstocks) of these materials matters, as do systems that can certify and authenticate these sources. Further, when Sun & Earth and its material suppliers are taken as a whole supply chain, environmental and safety regulation can be seen as having a generative economic effect rather than being a roadblock to industry and innovation.

[1] An early example of a niche company is the well-known Seventh Generation (www.seventhgeneration.com/about), while a recent example of mainstream green products is Clorox's GreenWorks line (www.cloroxgreenworks.com)

[2] A note on *natural:* the designation of a product as natural is a contested practice in the "green economy." However, there is broad if vague agreement as to what a product labeled as natural *should* be, and in this paper *natural* represents a constellation of attributes often expressed by players in the industry: products that are made from renewable resources (i.e., plants), are biodegradable, and are nontoxic. *Natural* here is understood as a heuristic for producers and consumers, not an absolute, ontological statement.

II. ATTENTION TO SOURCES: THE SUN & EARTH BRAND OF INNOVATION[3]

COMPANY OVERVIEW: SUN & EARTH

Sun & Earth, Inc., is a small, eighteen-year-old household-cleaning-products manufacturer located in King of Prussia, Pennsylvania. The company specializes in natural household goods, with a product line that currently consists of eight cleaners, including laundry detergent, dish detergent, fabric softener, all-purpose cleaner, hand soap, glass cleaner, dryer sheets, and automatic dish detergent. Sun & Earth's product distribution is primarily to supermarkets in the Northeast (Pennsylvania, New York, New Jersey, and New England), with an estimated revenue breakdown as follows: 70 percent grocery stores, 20 percent natural-foods stores, and 10 percent Web-based sales. Since Sun & Earth is a small company with a limited marketing budget, product promotion is often done in a grassroots style: mailings, community events, trade shows, sample giveaways, word of mouth, and tours for school groups. As one of the few small, niche brands with its own manufacturing capabilities, Sun & Earth is made up of a dozen employees, eight of whom are involved in production (mixing, bottling, and mailing the cleaners) and four of whom have managerial and administrative duties.

Sun & Earth was founded in the late 1980s by Jay Deakins, who saw a potential market for natural cleaners and began the company's product line with an orange-scented, all-purpose cleaner (still a popular product for the company today, under a different formulation). Although the company grew quickly and made some headway into the grocery market, it went bankrupt in 1994. Sun & Earth was then bought out by a group of investors, which included an early employee, John Mullins, who is now the president and CEO. In 2001 the company was sold to a venture-fund group that included such community-development foundations as the Barred Rock Fund. Unsuccessful in what Mullins considers, in retrospect, to have been a flawed and underfunded strategy to take the Sun & Earth brand national with this venture capital, the company was forced to refinance a few years ago. The company, only recently under Mullins's leadership, is now dedicated to slow, "organic" growth in the natural-foods and grocery sectors. Mullins states that Sun & Earth originally positioned its products as environmentally friendly but has shifted over the years to emphasize nontoxicity and safety for home use. He feels that products that are "better for your kids" and "also safe for the environment" catch a wider audience, a theory that is borne out by the various social groups and overlapping consumer niches that the company identifies as their core customers: parents concerned

[3] Unless otherwise noted, the source material for this section is John Mullins, interview by author, written notes and recordings, Norristown, PA, 7 March and 6 June 2007; and Virginia Lazarowitz, phone interview by author, written notes, Philadelphia, PA, 13 June 2007.

about toxic substances in the home, allergy sufferers, animal-rights activists, parents of autistic children, and environmentalists.

MATERIAL PATHWAYS: FROM PALM OIL TO DETERGENT

Pointing to a single defining material innovation for a company like Sun & Earth is difficult. Ostensibly "low-tech," produced from natural, plant-based feedstocks, and manufactured with alternative energy and local labor, these cleaners are in many ways sold as holistic packages of both product and process to consumers concerned about toxics, their "environmental footprint," and social justice. However, tracking the material changes involved in moving from, for example, palm-kernel oil in Malaysia to dish detergent in Pennsylvania reveals just how complex creating these cleaners can be.

One of Sun & Earth's most important suppliers and collaborators has been Cognis, an international firm headquartered in Monheim, Germany, that specializes in products based on plant-based feedstocks like palm-kernel and coconut oils for the personal care, cosmetics, and pharmaceutical industries. Virginia Lazarowitz is the marketing manager for a Cognis "Care Chemicals" site in Pennsylvania who has been working with Sun & Earth for years. She stated that in Cognis's terms Care Chemicals encompass personal, household, and industrial and institutional cleaning products; the company produces and sells raw materials and basic formulations to manufacturers of these consumer goods. According to Lazarowitz, Sun & Earth bases several of its cleaners on one of Cognis's Plantapon lines of multipurpose cleaners, a product constructed from palm-kernel and coconut oils, as well as dextrose from U.S.-grown corn.[4] This process means that before Sun & Earth sees this product, it has been refined from plant oils and sugars into a mixture of primarily sodium laureth sulfate, lauryl glucoside, and cocamidopropyl betaine.

Although John Mullins is currently the president and CEO of Sun & Earth, he is also the employee with the longest tenure in the company (sixteen years) and has been the person responsible for product improvement and development over much of his time there. He describes Cognis as having been instrumental in continued product development over the last eight years. With no formal training in chemistry, Mullins's development technique has been a process of trial and error involving back-and-forth interactions with the Cognis site in nearby Ambler, Pennsylvania. Mullins has taken advantage of basic raw-material formulations like Plantapon, Cognis's laboratory facilities, and its expertise in oleochemistry. In general terms Mullins starts with a basic cleaner from Cognis, chosen because it meets Sun & Earth's product parameters: plant-based, renewable, nontoxic, biodegradable, hypoallergenic, and so on. Once the basic formula is chosen, Mullins then draws on his own experience as well as advice from Cognis on how to make a particular cleaner perform better. He tweaks the product with a new ingredient or slightly different formulation and then uses laboratory performance tests (at the Cognis site and at inde-

[4] Cognis maintains raw-materials supplies and refining capabilities for these products through its Care Chemicals and Cognis Oleochemicals (a 50:50 joint venture with Golden Hope Plantations Berhad, Kuala Lumpur, Malaysia) divisions, including additional joint ventures with Thai oleochemical companies. See Cognis, "Cognis and Thai Oleochemicals Agree Fatty Alcohols Joint Venture," press release, 10 May 2006 (accessed 16 Jan. 2008), www.cognis.com/company/Press+and+Media/Press+Releases/2006/Press+Room+CN+May+10_2006(Eng).htm; and Cognis, *We Know How: Annual Report 2006,* 38–40, www.cognis.com/company/Company/Literature/Reports+2006/Annual+Report/ (accessed 13 June 2007).

pendent labs) to measure the effectiveness of these changes over the course of several months. The end consumer product is, for example, a reformulated Plantapon-based cleaner like hand soap, dish soap, or laundry detergent.

This trial-and-error recombination of raw materials and off-the-shelf formulations is a less technologically sophisticated material transformation than that which Cognis performs in constructing Plantapon from palm oil. However, Mullins feels that the material innovation that sets Sun & Earth apart and defines the company as a pioneer in the natural-cleaning-products market is the chemical branding of its products with a scent. One of the most important changes that Sun & Earth makes to the original Cognis products is the addition of a proprietary orange oil, something that Mullins considers Sun & Earth's signature characteristic and for which he claims priority, stating that "nobody put citrus oil in laundry detergent eight years ago. But eight years ago we were the first, and now you see it all the time." This particular oil, a food-grade additive sometimes used to heighten the flavor of orange juice, is one that Mullins began experimenting with years ago. It is now a scent that he considers part of the Sun & Earth brand. He believes that this food-grade oil offers a more authentically natural scent, as compared with other products that smell artificial or use citrus scents to claim natural-product status for mainstream petroleum-based cleaners. For Mullins, Sun & Earth products have to meet three basic requirements: the feedstocks have to fall within the company's definition of *natural*, the products have to match the sophistication and performance of mainstream cleaners, and the products have to smell authentically natural (in this case, like an actual edible orange). While the word *natural* on a product label stands in for a combination of environmental and health concerns and may influence the initial purchase of a cleaner, Sun & Earth's brand orange scent helps mark and reinforce its products as authentically *natural* in the mind of the consumer as they are being used. And Mullins states that for many customers the scent is one of the primary reasons for repeat purchase: "Even consumers that aren't worried about the environment or toxic chemicals buy our product because they love the way it works and the way it smells." In terms of material transformations the addition of orange scent is not simply tacked on: the reformulation is built around orange oil to ensure that its inclusion does not negatively affect the final product's consistency or performance.

MOTIVATION FOR INNOVATION: PERSPECTIVES ALONG THE PATH

Key to the Sun & Earth story is not only the material transformation involved in creating the products but also the company's stated motives for creating these products in the first place. Moreover, Sun & Earth and Cognis identify different reasons for the creation of their products by virtue of their different locations within networks of cleaning-product suppliers, producers, and consumers. Mullins gives primary credit to Sun & Earth's customers, stating flatly that "our products have been developed entirely based on customer suggestion and feedback." He describes a process of weighing customer requests for new products

against his assessment of the potential to actually develop these products, stating that "a lot of times the technology is just not there." As the example of Cognis demonstrates and as Mullins confirms, the new technology necessary for complying with customer requests often just walks in through the front door in the form of chemical suppliers and their distributors offering new raw materials and product possibilities. Most recently, Sun & Earth has been working with a cleaning-product distributor in order to offer biodegradable, orange-scented dryer sheets.

As Mullins admits, the constellation of values that encompasses the category of "natural" (i.e., renewable, nontoxic, biodegradable, hypoallergenic) for Sun & Earth, including the term *natural* itself, has no state- or industry-sanctioned meaning. These designations rely on a handful of factors to establish their validity with consumers. First, for the producers and consumers of these products, sources matter: a cleaner based on plant oils can be thought to be, for example, less toxic and more biodegradable than its petroleum-based counterpart. Second, these claims rely on what natural cleaners are generally *not* formulated with: for example, the solvent Butyl Cellosolve (ethylene glycol butyl ether). And third, companies like Sun & Earth rely on customer feedback about their products from parents, allergy sufferers, and others to bolster their products' status as natural in the form of testimonials. None of these types of claims in the larger green economy, however, go unchallenged by consumer safety groups, mainstream cleaning-product manufacturers, and other niche producers. This theme of authenticity is an important one for Sun & Earth and also applies to the more hidden production aspects of the company's operations. For Mullins the key to keeping core customers and to expanding has been not only offering "good products" but also practicing a company philosophy that includes living wages for employees and the purchase of wind power for manufacturing operations. When asked about these added expenses, he states that "if you're not practicing what you preach, you're subject to scrutiny and potential exposure. . . . You have to set the philosophy first." For Sun & Earth, authenticity must pervade the company's practices and products. It is precisely this issue of authenticity, however, that has been the subject of intense scrutiny in the cleaning-products industry. This scrutiny and the certification programs that have grown up with the natural-household-products industries are discussed in the next section.

Although Mullins often emphasizes customers with regard to product development, a key to connecting Sun & Earth with this larger "green economy" is to understand the perspective of the company's raw materials suppliers as well. In the cleaning-products industry Cognis's Lazarowitz sees state mandates to institutionalize the purchase of nontoxic cleaners as an important driver for new products, citing such programs in fourteen states. Along these lines she also considers U.S. Environmental Protection Agency programs like Design for the Environment and independent environmentally preferred products certifications like Green Seal as adding to the market pressure for natural cleaners. And, as others in the industry have commented, policies implemented by large corporations (like Wal-Mart's "Sustainable Chemicals Policy Road Map") can have far-reaching effects on product and raw-materials suppliers. In addition, at Cognis new products are often created locally for the customers' legal and market environments but are then borrowed across regions (and even across product lines) and adapted to other local or regional envi-

ronments. For example, products designed in Europe to meet the recent European Union Detergent Directive mandates for biodegradability can then be picked up by developers and marketers within Cognis in other parts of the world. The mechanisms for this process are in-house, multiregion conferences, and similar impending regulations in other parts of the world are often incentives for borrowing ideas from other branches of the company. Thus, regulation can be a driver for both technological innovation and diffusion. The pressure to innovate in this industry is applied not only by consumers (the perspective of Sun & Earth) but also by government regulations, third-party certification programs, and large retailers (the perspective of the raw-materials suppliers).[5]

To briefly summarize, Sun & Earth's innovation in the natural-cleaners industry has been twofold. First, feedstock substitution has created new cleaners that mimic petroleum-based surfactant technology in terms of performance but conform to market and regulatory demand for cleaners that are more natural. Second, the perceived pressure to appear authentically natural has led to novel parameters for the production process itself. That is, the insistence on things like well-paid workers and renewable energy sources for company operations are seen as commensurate with the values of investors and consumers likely to take an interest in natural cleaners, thus adding value to the product itself when these properties can be "marked" as natural through labeling and the addition of a natural scent. Hardly a solitary venture, innovation in small companies like Sun & Earth often takes the form of making practical use of outside, "upstream" technologies. This form of innovation can be clearly seen in the relationship between Sun & Earth and Cognis. While much of the high-tech surfactant creation takes place at companies like Cognis, Sun & Earth innovates by serving as a focal point for new oleochemical products available from a wide array of producers and distributors. Looking "downstream," innovation at firms like Sun & Earth can also be seen as a result of its direct interaction with consumers. New product ideas can come from customer feedback in the form of e-mails, letters, phone calls, and face-to-face interactions at public events, but these ideas then have to be reconciled with the technological feasibility of production.[6]

Furthermore, tracing these flows of technology between suppliers and manufacturers like Sun & Earth and Cognis is important because it highlights the different drivers of innovation from the various perspectives of the companies involved and helps connect this small case study to larger forces. While Sun & Earth has considered itself somewhat removed from environmental and health regulation and the environmental movement per se, and considers its immediate niche market as its source of ideas for product development, its suppliers see these larger regulatory demands and market forces as prime movers in product development. Rather than a stifling of industry or the market, in this

[5] This pattern of influences has also been identified in cleaning-products trade literature. See, for example, Michael McCoy, "Going Green," *Chemical & Engineering News* 85:5 (29 Jan. 2007), 13–19.

[6] Numerous science-studies scholars have written about innovation as constituting relationships between social groups, knowledge, and technologies. For more on innovation as dependent on "knowledge flow" between producers and users see Wendy Faulkner, "Conceptualizing Knowledge Used in Innovation: A Second Look at the Science-Technology Distinction and Industrial Innovation," *Science, Technology, & Human Values* 19:4 (Autumn 1994), 425–458; for product development as a sociotechnical process of "reciprocal tuning" see Andrew Pickering, "Decentering Sociology: Synthetic Dyes and Social Theory," *Perspectives on Science* 13:3 (2005), 367–369; and for values "inscribed" into technologies see Jim Johnson, a.k.a. Bruno Latour, "Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer," in *Ecologies of Knowledge: Work and Politics in Science and Technology,* ed. Susan Leigh Star, 257–277 (Albany: State University of New York Press, 1995).

case political pressure for natural products appears as a source of new product development and market growth. The next section places this type of innovation in a larger context and addresses some of the critiques of the green economy from both mainstream producers and environmentalists.

III. SUN & EARTH IN CONTEXT: EVOLUTION OF THE "GREEN ECONOMY"

CONFLICTS

The creation of these new markets has not been a smooth process, and the authenticity of companies and products in the so-called green economy has been contested from both inside and outside the business world over the last few decades. This contestation has been made more complex and heated with the entry of large corporations during the 1990s into what were formerly niche markets dominated by small businesses.[7] As plant-based chemical suppliers like Cognis have continued to grow, the chemical-industry trade literature has begun to report a conflict between petrochemical and oleochemical producers, placing petrochemical producers on the defensive about the environmental and health impacts of their products. The response of mainstream cleaning-product manufacturers has been to open the "black box" of natural-oil creation, as well as to question the sustainability of vegetable-oil sources like palm plantations in Southeast Asia. A global business manager for Shell Oil, for example, stated in a recent interview with *Chemical & Engineering News* that "there's a lot of media buzz about natural, but natural feedstocks go through steps such as esterification, hydrogenation, ethoxylation, and sulfonation before they are in a form suitable for use in consumer products."[8] In other words, "natural" is equated with "simple," and the final products are not simple by virtue of their processing. By pointing out the technologically mediated way in which natural chemicals are created and casting doubt on the biodegradability supposedly inherent in natural feedstocks, mainstream producers have questioned the differences between petrochemical and oleochemical feedstocks in terms of their environmental effects. This criticism of oleochemicals highlights the technologically constructed nature of these products and makes it clear that the transformation from coconut oil and corn dextrose to lauryl glucoside is hardly simple. However, it also indicates the importance of a material's *source* for establishing authenticity in the green economy. The response of oleochemical producers has been to refocus attention away from manufacturing processes and onto the feedstocks themselves, creating ways to certify these plant oils and the goods manufactured from them as natural and environmentally sustainable.

[7] I am using "green economy" here as a loose and contested category of businesses and products that make "environmentally friendly" or "natural" claims. While some commentators lament the indefinability of "green business" (see Joal Makower et al., "*State of Green Business 2008,*" Greener World Media, Jan. 2008, 57, www.stateofgreenbusiness.com (accessed 20 Feb. 2008), others claim to measure the value of the green economy in the United States at $228 billion (see Michael S. Rosenwald, "Showcasing the Growth of the Green Economy," *Washington Post,* 16 Oct. 2006, www.washingtonpost.com/wp-dyn/content/article/2006/10/15/AR2006101500685.html [accessed 17 Oct. 2007]).

[8] Michael McCoy, "Natural versus Synthetic: Oleochemicals and Petrochemical Makers Square Off," *Chemical & Engineering News* 85:5 (29 Jan. 2007), 18.

With regard to sustainability, for example, palm-oil producers in Southeast Asia have reacted to criticisms from petrochemical producers and concerns about rainforest destruction from environmental organizations by forming the Roundtable on Sustainable Palm Oil. This consortium of industry stakeholders and nongovernmental organizations was created in the early 2000s as a management and certification body to "ensure that the palm oil used in their products is from verifiable, sustainable sources."[9] In the years that Sun & Earth and similar companies—Seventh Generation being perhaps the best-known example—have been expanding their niches for natural cleaners, the claims of "natural" (along with nontoxic, biodegradable, renewable, hypoallergenic, and so on) have also come under scrutiny. And, like the example of sustainability and palm oil, the response has been the proliferation of certification systems for green products across industry, government, and the nonprofit sectors. Some examples include the Environmental Protection Agency's Design for the Environment and Environmentally Preferable Purchasing programs, the European Union's new REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances) regulations for chemical evaluation, the nonprofit Green Seal program and Co-op America's National Green Pages, and industry programs like SC Johnson's Greenlist system. Cognis also has its own internal classification system called Green Chemical Solutions, which rates the company's products in terms of "naturalness" for the use of purchasers like Sun & Earth. The purchasers can then decide how green they want to be in light of market demands.[10] Over the last two decades social and political pressures have fueled the growth of a number of small and large business ventures in natural cleaning products. This growth in turn has created a profusion of ways to certify the naturalness of these products, a process of constructing boundaries around the green economy, which is still very much in flux.

Furthermore, this confusion of government programs, certification systems, and marketing campaigns around natural household cleaners has ultimately affected the consumers attempting to participate in these niche markets. A recent article in the *New York Times* attempts to capture the perspectives of consumers facing choices in these markets. Citing the growth of the natural-cleaners market as a result of parents concerned with the exposure of their children and pets to unlabeled or unpronounceable chemicals and state mandates for using nontoxic cleaning agents in public institutions—with the pull and push of consumer demand and regulation already noted—the article also exposes an underlying tension in this growing market: how is a consumer to "know" if a given cleaner or chemical is authentically natural or nontoxic? Or, more precisely, how do various producers, consumers, and certifying bodies determine whether cleaners are natural or not? For some of the parents interviewed, and for the author of the article, this determination seemed to rely on the simplicity of the product or its scent. Mainstream products with no ingredients listed or ingredients with long chemical compound names that were often perceived to have harsh, "chemical" smells when used were considered untrustworthy. In contrast, products like those of Seventh Generation, with simple, explanatory ingredient lists; cleaners that used already common household goods like vinegar; and products that

[9] McCoy, "Natrual versus Synthetic," 18 (cit. note 8). Note that Cognis has been a member of the Roundtable since 2004.

[10] Cognis, " 'Green Chemical Solutions' from Cognis," press release, 12 June 2007, www.cognis.com/company/Press+and+Media/Press+Releases/2007/Press+Room+CC+June+12_2007+%28Eng%29.htm (accessed 16 Jan. 2008).

seemed to perform well but leave only a "faint, pleasant" scent were perceived to be safer.[11] Parents interviewed often remarked on the incongruence of using household cleaners that would be unsafe for their children or pets to ingest. From this perspective it is easy to see the appeal for companies like Sun & Earth to mark their products with a real, almost edible-smelling orange scent. To producers of petrochemical cleaners like SC Johnson and to indoor air-quality researchers, such intuitive decision making on cleaning-agent purchases can seem ill-informed. An environmental engineer at the University of California, Berkeley, was quoted in the same *New York Times* article as saying, "I haven't seen any good evidence supporting the idea that something that is being sold as green is really good for the people who are using the products. . . . There are good intentions but something of a disconnect between our hearts and our heads."[12] The solution for both consumers and producers seems to be more government involvement. Manufacturers would like to see more testing to confirm or deny the toxicity of various cleaning agents that they produce, and consumers want more oversight on the use of such advertising terms as natural, nontoxic, and hypoallergenic. Government oversight, however, is just one of a number of solutions proposed to address this dilemma.

Some economists suggest that this confusion of certification is simply one step toward an effective market-based resolution of the competing claims for natural products. Focusing on successful third-party certification systems, economist Michael Conroy points out that the share value of a corporation is tightly linked to its "brand value," and a brand is vulnerable to public attacks on the practices of a company or its suppliers. To mitigate the risk of having its brand tarnished (as well as to lower insurance rates, decrease staff turnover, and gain access to financing from socially responsible investors), it is in the interest of a business to seek credible social and environmental certification for its products. In Conroy's assessment third-party certification systems are the most credible and effective in maintaining this brand value.[13] Branding is not simply a process by which a product or company garners recognition; it is also a symbol that designates the origin and creation of that product and the values of the company, making brands both valuable and vulnerable.[14] Similarly, the certification process is not simply a burden on business; it is also an opportunity to add value to the firm's products. While household cleaners have yet to center on one particular certification scheme, the Fair Trade movement in coffee and other commodities is considered a successful example of an auditing and labeling process that adds quality to products for which consumers are willing to pay a premium.[15]

The Fair Trade movement may be an example of successful third-party certification for commodities like coffee and chocolate, but Green Seal is a historical example of the ongoing conflict in natural-cleaner certification. Created in the early 1990s to assess and

[11] Marcelle S. Fischler, "A Safe House?" *New York Times,* 15 Feb. 2007, F1.

[12] Ibid.

[13] Michael E. Conroy, *Branded! How the "Certification Revolution" Is Transforming Global Corporations* (Gabriola Island, British Columbia: New Society Publishers, 2007), 8–9, 15–17.

[14] Ibid., 291. Conroy uses the wine-industry term *provenance* to describe the power of brands to denote origin, chain of ownership, and quality of a product.

[15] Ibid., 97–199; see also Marie-Christine Renard, "The Interstices of Globalization: The Example of Fair Coffee," *Sociologia Ruralis* 39:4 (1999), 499; and Ken Peattie and Andrew Crane, "Green Marketing: Legend, Myth, Farce or Prophesy?" *Qualitative Market Research* 8:4 (2005), 359.

certify the environmental claims made by companies about their products, "Green Seal encountered significant opposition. When it released its standards for household cleaners in 1992, the national Soap and Detergent Association in the U.S. claimed that the standards were 'inconsistent and scientifically invalid.' "[16] While Fair Trade has achieved a measure of trust and dominance in the premium coffee market, no such consensus has emerged in household cleaners. As pointed out earlier, oleochemical producers like Cognis have relied instead on cues from regulatory bodies, especially in Europe, while small businesses like Sun & Earth have relied on their feedstock suppliers and customer feedback. Furthermore, as discussed above, no clear way has emerged for a third-party certifying organization to establish itself as trustworthy in the eyes of consumers purchasing household-cleaning products. This process taken perhaps to its logical extreme has given rise to meta-certification systems for certifying bodies.[17]

HYBRID ECONOMIES

Natural household cleaners, the related organic-food and Fair Trade movements, and the green economy more generally (however one wishes to bound the concept) are themselves seen by some historians as a part of a larger twentieth-century effort in the West to reconcile a modern, industrial lifestyle with the simultaneous growth of the modern environmental movement. By the 1980s a confluence of factors had set the stage for the expansion of the green economy in the United States: the shift in consumer culture and marketing from "mass to segment," the deemphasis of state environmental regulation after a great deal of major legislation and agency building in the 1970s, and an associated segmentation and professionalization of the environmental movement helped create "green consumerism" as both a new niche marketing opportunity for business and an expression of environmentalism on the part of individual consumers.[18] As historian Michael Bess points out, the expansion of the green economy allowed consumers to choose both environmentalism and economic growth and modern technology.[19] But this historical path has led to political and social tension that is apparent in the confusion and struggle over "natural" product authentication. In short, for environmentalists and cultural critics who see consumption and economic growth as *the* fundamental problem, the rapid growth of green products and professions in the 1980s and 1990s, which has been a source of economic growth in the West rather than of homeostasis or retraction, could hardly be considered the solution.[20] This critique has only intensified in the 2000s, with rising concern over global climate change and the "carbon intensity" of the U.S. economy

[16] Conroy, *Branded!,* 19 (cit. note 13).

[17] See, for example, the International Social and Environmental Accreditation and Labelling (ISEAL) Alliance Web site: http://ce13.citysoft.com/index.cfm?nodeid=1.

[18] Lizabeth Cohen, *A Consumer's Republic: The Politics of Mass Consumption in Postwar America* (New York: Knopf, 2003), 298–331; and Kirkpatrick Sale, *The Green Revolution: The American Environmental Movement 1962–1992* (New York: Hill and Wang, 1993), 51–60.

[19] See Michael Bess, *The Light-Green Society: Ecology and Technological Modernity in France, 1960–2000* (Chicago: University of Chicago Press, 2003), 241. Although Bess is writing on France, he sees this synthesis of "technological modernity and green vision" as a trend in all modern democracies.

[20] Ibid., 186–188, 291–292; see also Peattie and Crane, "Green Marketing," 368 (cit. note 15). For a Marxist critique of market-based environmentalism see John Bellamy Foster, *Ecology against Capitalism* (New York: Monthly Review Press, 2002).

in which "economic growth can offset, or even erase and negate, incremental improvements in lowering carbon emissions."[21]

Fundamentally, this tension is about what type of change the green economy represents. For environmentalists who have sought a profound change in the relationships between industrialized nations and natural resources, the political and economic changes of the last three decades of the twentieth century have seemed somewhat superficial—sweeping regulations that largely instituted such technological fixes as end-of-the-pipe pollution controls and green consumerism, which has added to energy and feedstock demands rather than replacing or reducing preexisting industries.[22] Oleochemicals seem to represent a hybrid of these superficial and profound changes. To the extent that plant-based cleaners, fuels, and so forth are product substitutions that go through similar stages of manufacture, distribution, consumption, and disposal, they would seem at best to represent a minor modification of the overall industrial economy under critique. Again, however, source matters. Replacing petroleum with plants represents for some a fundamental change in how humans use resources: nonrenewable versus renewable and inherently toxic versus inherently natural. The contestation that has grown up around plant-based cleaners concerning their provenance and naturalness can be seen as both a profound threat to the petroleum-based status quo and a superficial modification of business as usual that may, in the case of forest destruction and cooking-oil shortages in Southeast Asia, have extreme environmental consequences of its own.[23]

In summary, natural-cleaning-product manufacturers like Sun & Earth and oleochemical suppliers like Cognis are part of the rise of the green economy over the last three decades, in which numerous small green businesses and product certification systems, beginning largely in the 1980s, grew up together.[24] In the United States, as well as in other western democracies, a growing emphasis on niche marketing and on nonregulatory forms of environmentalism created the conditions for market-driven changes in the ways that manufacturers sourced, produced, and sold their products. Some economists have posited phases over this period in which nongovernmental organizations used market campaigns and these certification systems to pressure international corporations to change their practices. Missing from this picture is the role of small businesses like Sun & Earth creating new products, developing these niche markets and supply chains, and collectively cutting into the market share of mainstream producers who subsequently produced their own lines of green products (e.g., SC Johnson and Clorox). Placed against the backdrop of institutionalized environmental regulation in the United States and Europe, the result of this process has been a hybrid market of products and services that present new challenges of regulation, certification, and sustainability. This new, hybrid economy takes on various shades of green depending on one's perspective and place within it.

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[21] See, for example, Bill Baue, "How Green Are Green Business' Pastures?" 2 Feb. 2008, www.csrwire.com/News/10945.html (accessed 19 Feb. 2008).

[22] The "superficial" and "profound" distinction is Bess's, op. cit. For an overview of the rise of professional and legal environmentalism in the United States, as well as the subsequent radical environmentalist critique, see Sale, *Green Revolution* (cit. note 18).

[23] See, for example, recent reporting on palm-kernel oil shortages: *New York Times,* Multimedia, "The Other Oil Shock," www.nytimes.com/packages/html/business/20080119_PALMOIL_FEATURE/index.html; and *New York Times,* Multimedia, "The Struggle for Palm Oil," www.nytimes.com/slideshow/2008/01/18/business/worldbusiness/20080119_INDIA_SLIDESHOW_2.html (accessed 20 Jan. 2008).

[24] Conroy, *Branded!,* 19–21 (cit. note 13).

IV. FINDINGS

What does the case of a small, twelve-employee manufacturer of cleaners and detergents suggest about technology, innovation, and regulation? The following are a few findings of potential use for scholars, entrepreneurs, and policy makers.

1. The concept of innovation should include not only new materials and chemical compounds but also novel feedstock substitutions and recombinations of materials into consumer products. As a corollary, while such use of upstream technologies is generally considered innovative in the realms of high-tech industries like electronics (Apple computers in the 1970s, for example), such innovations also regularly take place in the realm of more mundane industries, like soaps and agriculture.[25] Further, exclusive focus on large corporations misses not only a significant proportion of the U.S. economy but also the diversity of ways available to small businesses to innovate.[26]

2. When it comes to consumers, especially as the green economy continues to grow, materials matter. More specifically, material *sources* matter. While the performance of a consumer product is of course vital (e.g., cleaning products should clean and hypoallergenic products should not trigger allergic reactions), just as important are the feedstocks for those products and their environmental and health impacts from cradle to grave. In many green niches it is not enough that a petrochemical and oleochemical cleaning product have similar or even identical properties as a surfactant; equally important are the characteristics that allow these consumers to classify oleochemicals as more natural. In other words, stated from the perspective of the consumer, someone who purchases a Sun & Earth product is not simply purchasing a material innovation but rather a suite of materials, processes, and values aligned with their own needs and values.

3. As the use of the term *natural* to describe manufactured goods continues to be contested, the development of systems and markers of authenticity has become increas-

[25] While perhaps not a commonplace assumption in some industry and economic policy circles, this "finding" is shared by numerous historians of technology and economy. See, for example, David Edgerton, T*he Shock of the Old: Technology and Global History since 1900* (New York: Oxford University Press, 2007); and Nick Von Tunzelmann and Virginia Acha, "Innovation in 'Low-Tech' Industries," in *The Oxford Handbook of Innovation,* ed. Jan Fagerberg, David C. Mowery, and Richard R. Nelson, 407, 416 (New York: Oxford University Press, 2005).

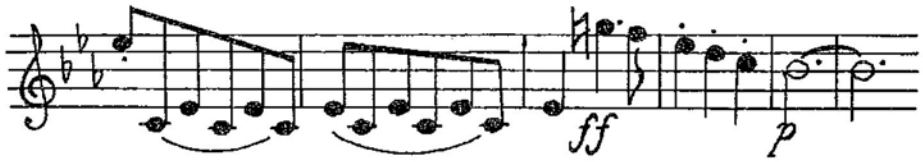
[26] "In the United States, small businesses (defined by the U.S. Small Business Association as independent firms with less than 500 employees) employ half of the private-sector workforce and use half of the electricity and natural gas consumed by the commercial and industrial sectors. In 2006, small businesses accounted for 99.9 percent of the 26.8 million businesses in the country" (from Jonathan Bardelline, "The Big Impact from Greening Small Businesses," Greener World Media, 19 Feb. 2008, www.greenbiz.com/news/reviews_third.cfm?NewsID=55600 [accessed 20 Feb. 2008]).

ingly important. In the case of Sun & Earth a scent has been developed that brands all the company's products as natural and marks them as plant-based and nontoxic. Just as important, the company makes use of customer testimonials as a grassroots way to market these products to potential consumers. In the green economy more broadly a host of certification systems are used in a similar way to testify, in the language of chemical expertise, to the environmental friendliness and safety of natural products. As these issues of advertisement, certification, and consumer trust continue to be worked out, and as more and more large corporations introduce lines of green cleaning products, it will become increasingly important for small, pioneering companies like Sun & Earth to watch these trends and gauge their own claims of naturalness, particularly as the concept of a green economy itself comes under scrutiny.

4. Certification and regulation, through third-party nongovernmental organizations, watchdog groups, and governmental agencies, can have a motivational effect on markets and innovation, particularly environmental and safety regulations.[27] Attention paid to companies like Sun & Earth and to the larger green economy might change the way we think about the environmental movement of the latter half of the twentieth century. Narratives that focus on the social and political movements to resist or constrain existing, polluting companies miss part of the story, namely, that the regulatory and consumer-rights movements of the 1970s and 1980s have also been generative: they have created new industries offering new ways to accomplish old tasks. The social and environmental effects of these "new ways" in the aggregate, however, are still very much under debate.

[27] For business and policy literature on regulation and innovation see Nicholas A. Ashford and Robert F. Stone, "Using Regulation to Change the Market for Innovation," *Harvard Environmental Law Review* 9 (1985), 420, 463–464; Michael E. Porter and Claas van der Linde, "Green and Competitive: Ending the Stalemate," *Harvard Business Review* Sept.-Oct. (1995), 120, 134; Nicholas A. Ashford and George R. Heaton, Jr., "Regulation and Technological Innovation in the Chemical Industry," *Law and Contemporary Problems* 46:3, Federal Regulation of the Chemical Industry (Summer 1983), 109–157; *Harvard Business Review on Green Business Strategy* (Boston: Harvard Business School Press, 2007); Daniel C. Esty, *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage* (New Haven, CT: Yale University Press, 2006). For social science literature on these issues see Alan Irwin and Philip Vergragt, "Re-thinking the Relationship between Environmental Regulation and Industrial Innovation: The Social Negotiation of Technical Change," *Technology Analysis & Strategic Management* 1:1 (1989), 57–70; Johan W. Schot, "Constructive Technology Assessment and Technology Dynamics: The Case of Clean Technologies," *Science, Technology, & Human Values* 17:1 (Winter 1992), 36–56; and Gisela Welz, "The Cultural Swirl: Anthropological Perspectives on Innovation," *Global Networks* 3:3 (2003), 257.

View of the Cognis Oleochemicals fatty alcohol facilities, Dusseldorf Holthausen. Photo courtesy Cognis.



Dear "Sun and Earth"

I feel very much like a TV Commercial of a happy-faced housewife that has used Sun and Earth for the first time. I've never thought twice about grabbing TIDE at the Supermarket. But Jim brought me a pack filled with your products. Finally one day I opened it and used the washing detergent. I love it. Love the smell. love the softness and most of all the enviromental issues surrounding it. I'm cleaning out my cupboards and will replace with your products.

(over)

Customer letter to Sun & Earth. Image courtesy Sun & Earth.

V. APPENDIXES

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3. ABOUT THE ROBERT W. GORE MATERIALS INNOVATION PROJECT

Begun in 2006, the Robert W. Gore Materials Innovation Project, conducted by the Chemical Heritage Foundation's Center for Contemporary History and Policy, aims to illuminate the diverse contributions of materials innovation within the broader process of technological development in the contemporary age. Conceived as a three-year project, it documents, analyzes, and makes known the immense benefits of materials innovation through its white paper series, Studies in Materials Innovation, and public symposia.

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