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## DuPont and the Limits of Corporate Environmentalism

In 1989, Edgar Woolard began his tenure as chief executive of the chemical giant DuPont by calling for a new “corporate environmentalism.” DuPont has changed dramatically since then to become more environmentally sustainable, but the company still has a poor record in some areas. The sustainability push also had mixed financial consequences. Though eco-efficiencies saved DuPont billions of dollars, the effort to create more sustainable engines of corporate growth failed to meet Wall Street expectations. The DuPont story offers important insights into the difficulties of greening an established industrial enterprise.

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**I**n a pioneering 1997 analysis of how American oil and chemical companies responded to growing concern about the environment, management professor Andrew Hoffman argued that the late 1980s and early 1990s were a turning point. In the 1970s, when the nation’s first tough antipollution laws took effect, executives saw the environment mostly as a regulatory issue: their goal was technical compliance with the new rules, which they considered onerous. In the 1980s, industry leaders supported President Ronald Reagan’s efforts to undo the 1970s regulatory framework. But as environmental activists increasingly

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targeted corporations, the leading oil and chemical firms concluded that they needed to do more to demonstrate their social responsibility. In the late 1980s and early 1990s, many revised their management structures to make environmental issues a fundamental part of organizational decision-making. Hoffman called the new approach “strategic environmentalism.”<sup>1</sup>

Hoffman’s argument was prophetic. In the last thirty years, many U.S. corporations have committed to becoming more environmentally sustainable. They have worked to conserve energy, reduce waste and toxic emissions, and develop eco-friendly products. They now issue annual environmental reports, and their executive team typically includes a sustainability officer.

How much has changed? Are companies truly doing business differently, or have they simply become less unsustainable? What has driven corporate efforts to improve, and what has stood in the way? Scholars have given too little attention to these questions. Much of the best work so far is by social scientists, from David Vogel’s *The Market for Virtue* to Peter Dauvergne and Jane Lister’s *Eco-Business*. Though the literature on the principles and practice of sustainable business is burgeoning, management scholars have aimed primarily to show how companies profit from green initiatives. As a result, they have largely ignored the obstacles to improvement. Instead, they focus on firms that have done the most to go “beyond compliance” with environmental regulations. Historians also have barely begun to assess the growing interest in sustainable management. Geoffrey Jones explores the strengths and weaknesses of corporate environmentalism in the last two chapters of *Profits and Sustainability*, a pathbreaking 2017 study of “green entrepreneurship” from the nineteenth century to the present. But a multiauthored history of corporate responsibility in the United States only touched on the subject. We need more detailed historical studies of corporate environmental performance since the late 1980s.<sup>2</sup>

<sup>1</sup> Andrew J. Hoffman, *From Heresy to Dogma: An Institutional History of Corporate Environmentalism*, expanded ed. (Stanford, 2001).

<sup>2</sup> David Vogel, *The Market for Virtue: The Potential and Limits of Corporate Social Responsibility* (Washington, DC, 2006); Peter Dauvergne and Jane Lister, *Eco-Business: A Big-Brand Takeover of Sustainability* (Cambridge, MA, 2013); Geoffrey Jones, *Profits and Sustainability: A History of Green Entrepreneurship* (Oxford, 2017), 356–403; Archie B. Carroll, Kenneth J. Lipartito, James E. Post, and Patricia H. Werhane, *Corporate Responsibility: The American Experience* (Cambridge, UK, 2012), 352–57, 390–92, 397–401. Several scholars offer compelling case studies in Hartmut Berghoff and Adam Rome, eds., *Green Capitalism? Business and the Environment in the Twentieth Century* (Philadelphia, 2017). For an overview of the historiography, see Ann-Kristin Bergquist, *Business and Sustainability: New Business History Perspectives* (Harvard Business School Working Paper No. 18-034, Cambridge, MA, 2017). A partial exception to the boosterism of the management literature is

DuPont is a particularly compelling case to study. Since Alfred Chandler's classic *Strategy and Structure*, historians have often analyzed the company as an innovator. It pioneered new forms of management when it shifted from a gunpowder and explosives manufacturer to a multiline chemical firm. It broke new ground in corporate research and development. It also took the lead in promoting technological progress as a cornerstone of the mass-consumption economy. Like the chemical industry as a whole, however, DuPont had a woeful environmental record for much of the twentieth century. It was one of the nation's worst corporate polluters, and it topped the list of responsible parties for Superfund hazardous-waste sites. It was attacked by muckraking journalists and environmental organizations. Then, beginning in 1989, DuPont made sustainability a priority. That effort led to a stunning turnaround. *BusinessWeek* honored DuPont in 2005 as the greenest U.S. corporation. By 2010, DuPont was often cited as a model by sustainable-business experts.<sup>3</sup>

This article focuses on DuPont's record from 1989 until 2017, when DuPont and Dow Chemical merged. Because the challenge of greening an established industrial enterprise is multifaceted, four areas are examined: corporate strategy; operations; product development; and public relations. Looking at the most important developments in each area offers fresh insight into the limits of corporate environmentalism.

The DuPont story makes clear that many factors might inspire corporate efforts to become greener. Leadership was essential, but DuPont's CEOs were not tree huggers. They had to make "the business case" for sustainability. They argued that pressure to reduce the company's footprint would ultimately make operations more efficient. They sought to minimize risk; they wanted to avoid bad publicity, and they were afraid of getting caught off guard by new regulations. They worried that a poor environmental image would hamstring their ability to

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Yossi Sheffi, *Balancing Green: When to Embrace Sustainability in a Business (and When Not To)* (Cambridge, MA, 2018).

<sup>3</sup>On DuPont's innovations, see Alfred D. Chandler Jr., *Strategy and Structure: Chapters in the History of the American Industrial Enterprise* (Cambridge, MA, 1962); David A. Hounshell and John Kenly Smith Jr., *Science and Corporate Strategy: Du Pont R&D, 1902–1980* (New York, 1988); and Pap A. Ndiaye, *Nylon and Bombs: DuPont and the March of Modern America* (Baltimore, 2007). The pollution and Superfund rankings are from Jack Doyle, *Hold the Applause! A Case Study of Corporate Environmentalism as Practiced at DuPont* (Washington, DC, 1991), 11; Harold C. Barnett, *Toxic Debts and the Superfund Dilemma* (Chapel Hill, 1994), 21. For examples of both criticism and praise of DuPont's environmental performance, see Chris Laszlo, *Sustainable Value: How the World's Leading Companies Are Doing Well by Doing Good* (Stanford, 2008), 82, 86; and Peter Senge, Bryan Smith, Nina Kruschwitz, Joe Laur, and Sara Schley, *The Necessary Revolution: Working Together to Create a Sustainable World* (New York, 2010), 124–33.

attract talented employees. They also saw a chance to claim potentially huge new markets.<sup>4</sup>

Yet the company's recent history is a cautionary tale. Though DuPont changed dramatically from 1989 to 2017, the sustainability push fell short in critical ways. Executives had more incentive to solve some environmental problems than others. Indeed, they sometimes were rewarded for acting irresponsibly. Despite the cliché of the sustainable-management literature that green can be gold, DuPont failed to meet Wall Street expectations. Eco-efficiencies saved billions of dollars, but the effort to create more sustainable engines of corporate growth encountered many obstacles. Because DuPont's managers were not trained to think about sustainability, they made some mistakes. But the biggest obstacles were beyond the company's control: the rules of the market worked against the success of green initiatives.<sup>5</sup>

That conclusion should unsettle business historians. The field's basic unit of analysis is the firm, yet the DuPont case makes clear that corporate decision-making is shaped by regulations, codes of conduct, and informal expectations that no individual company can change. Only a few of those "social rules" explicitly concern the environment. Yet many others—from accounting standards to disclosure requirements—are part of the calculus when managers decide how to deal with environmental issues. Though literally taken for granted, those rules can change over time, and they deserve more scholarly attention.<sup>6</sup>

## Strategy

Before Edgar Woolard became chief executive and board chair in 1989, environmental concerns never were a priority at DuPont. Though some employees felt a duty to minimize pollution, the company mostly looked for the cheapest ways of dealing with the by-products of production. When people complained about the quality of the air or water near DuPont facilities, officials argued that environmental degradation was the price of prosperity. Top executives often belittled

<sup>4</sup>Though historians have written little about what has driven recent corporate interest in sustainability, the literature about motives for environmental reform in earlier periods is more substantial. Christine Meisner Rosen's work is especially valuable, beginning with "Businessmen against Pollution in Late Nineteenth Century Chicago," *Business History Review* 69 (Autumn 1995): 351–97. The green-management literature, however, has much to say about motivation. A particularly good and succinct example is Hoffman, *From Heresy to Dogma*, 206–12.

<sup>5</sup>The cliché dates to Daniel C. Esty and Andrew S. Winston, *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage* (New Haven, 2006).

<sup>6</sup>My thinking on this subject owes much to Paul F. Steinberg, *Who Rules the Earth? How Social Rules Shape Our Planet and Our Lives* (New York, 2015).

concern about the hazards of chemicals. The Du Pont family had a long history of opposing government regulation, and the company did too. After the passage of the federal antipollution acts of the early 1970s, DuPont lobbied for industry-friendly interpretations of the new mandates. Then the goal was simply to do what the law required. Occasionally management had to deal with the discovery that a DuPont product caused environmental damage—the destruction of the ozone layer by CFCs, above all—but those crises did not change the way the company operated.<sup>7</sup>

Woolard began his term as DuPont's leader by calling for a new "corporate environmentalism"—a phrase he coined. In a speech later published in a trade journal, he acknowledged that industry lacked credibility as a steward of the environment. For too long, he argued, "many manufacturing executives saw environmentalism as a nuisance and environmentalists as radicals of one variety or another." But public demand for environmental protection meant that merely complying with regulations was no longer enough. To maintain the goodwill of society and compete in the marketplace of the future, corporations would need to be green. Woolard therefore vowed to become DuPont's "chief environmentalist." He outlined an eco-agenda for the 1990s that included a dramatic drop in hazardous-waste production. The company also would stop using toxic pigments in some products, begin to collect and recycle plastic waste, and manage land at some facilities to enhance wildlife habitat. Woolard promised in addition to make environmental performance part of the managerial compensation formula.<sup>8</sup>

Woolard was not the only industry leader to see the need to make environmental protection a higher priority. In October 1989, about six months after Woolard's speech, the Chemical Manufacturers Association launched its Responsible Care program. Members promised to uphold a

<sup>7</sup> Benjamin Ross and Steven Amter, *The Polluters: The Making of Our Chemically Altered Environment* (New York, 2010), 21–27, 129–40, 144–46; James Phelan and Robert Pozen, *The Company State: Ralph Nader's Study Group Report on DuPont in Delaware* (New York, 1973), 42, 321–30; Russell W. Peterson, *Rebel with a Conscience* (Newark, DE, 1999), 249; Lettie McSpadden, "Industry's Use of the Courts," in *Business and Environmental Policy: Corporate Interests in the American Political System*, ed. Michael E. Kraft and Sheldon Kamieniecki (Cambridge, MA, 2007), 244–45; Forest L. Reinhardt and Richard H. K. Vietor, *Business Management and the Natural Environment: Cases & Text* (Cincinnati, 1996), 1.7–1.18. For a more favorable view of DuPont's concern about pollution, see John K. Smith, "Turning Silk Purses into Sows' Ears: Environmental History and the Chemical Industry," *Enterprise & Society* 1 (Dec. 2000): 785–812. Woolard acknowledged that environmental protection had not been a DuPont priority in Bruce Smart, ed., *Beyond Compliance: A New Industry View of the Environment* (Washington, DC, 1992), 187.

<sup>8</sup> Edgar S. Woolard Jr., "Environmental Stewardship," *Chemical and Engineering News* 67 (29 May 1989): 12–15.

set of safety and environmental principles, though the association left decisions about how to do that to company executives. In the early 1990s, Dow and Monsanto worked to become greener. Because Woolard had taken the lead, however, his promises stood out.<sup>9</sup>

To many people, Woolard's eco-commitment was shocking. He had built his managerial reputation as a cost cutter, yet he seemed to be embarking on a path that would make the company less competitive. Many DuPonters doubted the technical feasibility of some of his promises. Even his daughter asked if he really was serious. Woolard was. Earlier in his career, he had learned that addressing environmental concerns could sometimes lead to profitable improvements in operations, and he believed in the company's ingenuity. "I've got more confidence in you than you've got in yourself," he told the company's researchers. Woolard was also convinced that DuPont had no choice: the failure of the Reagan administration's effort to undermine the nation's antipollution laws made clear that the environmental movement had become a fixture in American life.<sup>10</sup>

Woolard already could see the threat to DuPont's reputation. Beginning in 1987, American corporations were required to provide a public summary every year of the pollutants they produced, and DuPont executives were mortified when the first Toxic Release Inventory revealed that the company's record was one of the nation's worst. The new data emboldened a handful of environmental groups that had begun to target major corporations, especially Greenpeace, which became DuPont's antagonist. Because DuPont was the world's leading producer of CFCs, Greenpeace attacked the company as an ozone destroyer as well as a brazen polluter, and activists used guerilla tactics to dramatize their critique. Though the Greenpeace protests were largely ignored by the media, they added to Woolard's sense that DuPont needed to rethink its approach to environmental issues.<sup>11</sup>

<sup>9</sup> Andrew A. King and Michael J. Lenox, "Industry Self-Regulation without Sanctions: The Chemical Industry's Responsible Care Program," *Academy of Management Journal* 43, no. 4 (2000): 699–700; Jack Doyle, *Trespass against Us: Dow Chemical and the Toxic Century* (Monroe, ME, 2004), 233–35; John Holusha, "Dow's Cleanup Czar Unlocks the Gates," *New York Times*, 20 Sept. 1992; Bartow J. Elmore, "The Commercial Ecology of Scavenger Capitalism: Monsanto, Fossil Fuels, and the Remaking of a Chemical Giant," *Enterprise & Society* 19 (Mar. 2018): 153–78.

<sup>10</sup> Adrian Kinnane, *DuPont: From the Banks of the Brandywine to Miracles of Science* (Wilmington, DE, 2002), 236, 238 (quotation); John Holusha, "Ed Woolard Walks DuPont's Tightrope," *New York Times*, 14 Oct. 1990; Edgar S. Woolard Jr., interview by James G. Traynham, 10 June 1999, transcript, Chemical Heritage Foundation, <https://oh.sciencehistory.org/oral-histories/woolard-jr-edgar-s>; Carol Sanford, *The Responsible Business: Reimagining Sustainability and Success* (San Francisco, 2011), 177–80; Hoffman, *From Heresy to Dogma*, 85–86.

<sup>11</sup> Esty and Winston, *Green to Gold*, 111; Priscilla Murphy and Juliet Dee, "DuPont and Greenpeace: The Dynamics of Conflict between Corporations and Activist Groups," *Journal*

The first report of the Intergovernmental Panel on Climate Change in 1990 strengthened Woolard's resolve. DuPont had struggled for more than fifteen years to respond to changing scientific understanding of the hole in the ozone layer, and Woolard saw that history as an object lesson. Though the company eventually developed profitable replacements for CFCs, Woolard knew that the controversy might instead have destroyed a significant product line. The new concern about human impact on the climate might pose an equally serious threat. Indeed, some of DuPont's scientists were concerned about the issue. To ensure that the company would never fall behind the scientific curve, Woolard decided that cutting greenhouse-gas emissions also needed to be part of his environmental agenda.<sup>12</sup>

Because DuPont had always given considerable autonomy to the managers of its various "businesses," Woolard could not make the company greener by fiat. He needed employees to buy in. To help make the pitch, he created the position of vice president for safety, health, and environment. His choice for that job—Paul Tebo, a chemical engineer who had run two of DuPont's biggest units—had the credibility to make a strong business argument for reducing pollution and energy use; he ultimately won national recognition for environmental leadership. Though operational changes were the heart of Woolard's vision of corporate environmentalism, he hoped the company could turn waste-reduction expertise into a consulting business with annual revenue of \$1 billion by 2000. Woolard also hoped to strengthen relationships with DuPont's business clients. "Our customers are feeling the pressure and they are saying to us, 'Can you give us more environmentally safe products,'" he told the *New York Times* in 1990. To demonstrate the company's newfound resolve, Woolard appointed the first director of the Environmental Protection Agency (EPA) to the board of directors. He also spoke regularly about environmental issues to industry, civic, and environmental groups.<sup>13</sup>

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*of Public Relations Research* 4, no. 1 (1992): 7–10; Laszlo, *Sustainable Value*, 83. Woolard acknowledged that Greenpeace was a prod to reform in "Environmental Stewardship," 2. Other DuPont employees also pointed to the first Toxic Release Inventory and the Greenpeace protests as motivators, according to a largely uncritical analysis of the company by the son of Woolard's successor: see Scot Holliday, "A Case Study of How DuPont Reduced Its Environmental Footprint: The Role of Organizational Change in Sustainability" (PhD diss., George Washington University, 2010), 75–79.

<sup>12</sup> Andrew Hoffman, *Carbon Strategies: How Leading Corporations Are Reducing Their Climate-Change Footprint* (Ann Arbor, 2007), 22, 92; Laszlo, *Sustainable Value*, 83. The first questions about CFCs came in the early 1970s, and DuPont publicly promised in 1974 to stop producing them if their harmfulness ever was scientifically proved. See Edward A. Parson, *Protecting the Ozone Layer: Science and Strategy* (New York, 2003), 32–33.

<sup>13</sup> Smart, *Beyond Compliance*, 188; Andrea Spencer-Cooke, "Hero of Zero," *Tomorrow Magazine* 10 (Nov./Dec. 2000): 10–16; David Kirkpatrick, "Environmentalism: A New

The emphasis on environmental performance did not end when Woolard stepped down as CEO in 1995. Woolard stayed on as board chair for the next two years, and he continued to shape DuPont's strategic planning. When his successor retired in 1998, the next CEO and chair, Chad Holliday, continued the drive for eco-efficiency during his ten years in office.

Holliday pushed especially hard to make DuPont a leader in addressing the problem of climate change. In addition to setting more ambitious greenhouse-gas goals for the company, he worked to build support for national action. DuPont helped launch the Chicago Carbon Exchange to test the potential of market mechanisms for dealing with the issue. Then it was one of the few corporations to join the U.S. Climate Action Partnership, which lobbied for a federal cap-and-trade system that Holliday hoped would reward DuPont for acting aggressively to cut emissions.<sup>14</sup>

Holliday also opened the company to new environmental perspectives. He hired a sustainability consulting firm founded by a Greenpeace activist, formed a Biotechnology Advisory Panel to help anticipate potential problems, and partnered with the Environmental Defense Fund on a safety manual for nanotechnology research. He even cowrote a sustainable-management manifesto, *Walking the Talk*, that included case studies of dozens of businesses.<sup>15</sup>

For Holliday, however, the fundamental challenge was "sustainable growth." He wanted to invest in enterprises that addressed three megatrends: the conversion to renewable energy and materials, the demand for greater safety and security, and the need to increase farm productivity. Those goals were not entirely new. During the 1990s, DuPont had begun to develop a greener fiber and intensified research on "clean energy." But Holliday's focus on sustainability was a fundamental

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Crusade," *Fortune*, 12 Feb. 1990; Hoffman, *From Heresy to Dogma*, 125; E. Bruce Harrison, *Going Green: How to Communicate Your Company's Environmental Commitment* (Homewood, IL, 1993), 50, 127. The quotation is from Holusha, "Ed Woolard Walks Du Pont's Tightrope."

<sup>14</sup> Senge et al., *Necessary Revolution*, 127; Hoffman, *Carbon Strategies*, 36, 93–101; Eric Pooley, *The Climate War: True Believers, Power Brokers, and the Fight to Save the Earth* (New York, 2010), 140, 141, 156; Judith A. Layzer, "Deep Freeze: How Business Has Shaped the Global Warming Debate in Congress," in *Business and Environmental Policy: Corporate Interests in the American Political System*, ed. Michael E. Kraft and Sheldon Kamieniecki (Cambridge, MA, 2007), 112–13, 117–18; Nicholas Varchaver, "Chemical Reaction," *Fortune*, 22 Mar. 2007. Before Holliday's tenure, DuPont briefly belonged to the Global Climate Coalition, which opposed legislation.

<sup>15</sup> Paul Gilding, *The Great Disruption: How the Climate Crisis Will Bring On the End of Shopping and the Birth of a New World* (New York, 2011), 152–55; Chad Holliday, "How Working with NGOs Made DuPont a Better Company," *Forbes*, 29 Mar. 2010; Senge et al., *Necessary Revolution*, 127–28; Charles O. Holliday Jr, Stephan Schmidheiny, and Philip Watts, *Walking the Talk: The Business Case for Sustainable Development* (San Francisco, 2002).



change. It required redefining the company's strategy for the future, not just making environmental concerns a higher priority. Though many of DuPont's iconic products derived from fossil-fuel feedstocks, Holliday was keen to move the company away from petrochemistry. He sold Conoco—the oil company DuPont had acquired in 1981—and used the proceeds to buy Pioneer Hi-Bred, a leader in agricultural biotechnology. He also sold DuPont's fiber business, which made nylon and Dacron polyester. His successor, Ellen Kullman, then got the company out of the production of commodity chemicals—raw materials used by a host of manufacturers—by turning over that business to a new company initially owned by DuPont's shareholders: Chemours. Those decisions all spoke to a profound refashioning of corporate identity. With expertise in biology as well as chemistry, DuPont aimed to be “the world's most dynamic science company.”<sup>16</sup>

To be sure, Holliday's definition of sustainability was not universally accepted. This was especially true of his emphasis on food production. Though DuPont promised to help farmers increase yields while reducing their environmental impact, critics argued that the company's seeds and agrochemicals reinforced a way of farming that was inherently flawed; modern agriculture relied on nonrenewable resources and risked the health of people and ecosystems.<sup>17</sup>

Even broadly defined, the sustainable-growth strategy had limits. DuPont made thousands of things, and some contributed little or nothing to Holliday's megatrends. The company was still too big and diverse to put research-and-development money into just three areas. The greening project therefore was a matter of percentages. What share of investment furthered the company's new goals? That became a critical metric.<sup>18</sup>

The effort to remake DuPont also did not involve a commitment to sustainability for its own sake. The company was publicly traded, so profitability always had to be the priority in thinking about corporate strategy. Holliday and Kullman often justified their decisions solely in

<sup>16</sup> Chad Holliday, “Sustainable Growth, the DuPont Way,” *Harvard Business Review* 79 (Sept. 2001): 129–36; Smart, *Beyond Compliance*, 189; Senge et al., *Necessary Revolution*, 127–33; Kathryn Rudie Harrigan, *E.I. du Pont de Nemours & Company: Cleaning House* (Columbia CaseWorks CU127, New York, 2012), 1, 6–7; David Gelles, “DuPont to Split into 2 as It Plans to Spin Off a Major Segment,” *New York Times*, 24 Oct. 2013. The quotation is from Laszlo, *Sustainable Value*, 81–82.

<sup>17</sup> DuPont, *Science Meets Sustainability: DuPont 2013 Sustainability Progress Report* (2013), 6, [http://www.dupont.com/content/dam/assets/corporate-functions/our-approach/sustainability/documents/2013DuPont%20Sustainability%20Report\\_web.pdf](http://www.dupont.com/content/dam/assets/corporate-functions/our-approach/sustainability/documents/2013DuPont%20Sustainability%20Report_web.pdf). The critical literature about modern agriculture is immense. For a recent critique of DuPont and other agricultural biotech firms, see McKay Jenkins, *Food Fight: GMOs and the Future of the American Diet* (New York, 2018).

<sup>18</sup> DuPont, *Science Meets Sustainability*, 8–9.

business terms. Because the price of oil had not stayed high, Conoco underperformed. Getting out of the oil business also reduced potential liabilities for spills and hazardous-waste cleanups. Synthetic fibers and commodity chemicals had become highly competitive markets with low margins. To earn high rates of return on investment, DuPont needed to develop knowledge-intensive products and services that could command premium prices. Both CEOs bet that the sustainability push offered the best chance to do that.

Beyond helping to set priorities, the emphasis on sustainable growth changed the company's sense of itself. As Holliday's eco-consultant told DuPont's managers, a corporation cannot win the loyalty of people just by providing jobs, selling products, and creating shareholder value. The new ideal made DuPont a more exciting, "purpose-driven" place to work. It helped boost morale and attract talented recruits. "It's a powerful motivator, particularly for younger employees today, to know your company is working in the right areas and doing the right things," Tebo concluded. "Clearly, when you move from laggard to leader, that's important."<sup>19</sup>

But making sustainability profitable was a bigger challenge than Holliday imagined. In his first nine years as CEO, the company's stock fell by 10 percent, while the Dow Jones average went up 17 percent. The disappointing financial results led to tough questions from restive shareholders. Wall Street analysts argued that DuPont had paid too much for Pioneer and received too little for its fiber business. It also missed the oil boom of the early 2000s. Though a slew of DuPont products could help build a more sustainable economy, their profitability often depended on the growth of markets that were still immature, especially solar and wind power. The company's biggest investments in greener technologies would take years to pay off, if they ever did. In 2007, a *Fortune* reporter concluded that it was "too soon to know whether Holliday is the man who saw the future—or perhaps saw it too early."<sup>20</sup>

After Holliday stepped down in 2008, Kullman faced even more pressure to increase returns. An activist investor fought to seize control of the board—he thought DuPont was not maximizing shareholder value—and that battle hurt Kullman. She resigned in 2015. Then DuPont and Dow agreed to merge, with the ultimate goal of dividing into three single-minded companies. One would focus on

<sup>19</sup> Senge et al., *Necessary Revolution*, 127. For the consultant's advice, see Gilding, *Great Disruption*, 152. In addition, see Laszlo, *Sustainable Value*, 86.

<sup>20</sup> Varchaver, "Chemical Reaction." See also Harrigan, *Cleaning House*.

agriculture, another on materials, and the third on specialty chemicals.<sup>21</sup>

The mixed results from the sustainable-growth push were not the only reason for DuPont's breakup, but the company's experience suggests that the sweet spot for sustainability initiatives is not huge. A variety of factors can lead to mishits. Some are risks in any new business venture. The timing has to be right: executives want to be one or two steps ahead of their competitors, not ten. In a world that cares mostly about the next quarter, any long-term strategy tests the patience of investors. But CEOs committed to sustainability also have to overcome a critical flaw in the capitalist system. Because no one pays the full environmental costs of production or consumption, green goods and services are forced to compete with dirtier but cheaper alternatives. They still might find a market, but that market often will not be big enough to meet the growth targets of major corporations.<sup>22</sup>

### Operations

The effort to lighten DuPont's environmental footprint was even more successful than Woolard hoped. From 1990 to 2004, the company cut toxic air emissions by 90 percent, greenhouse-gas generation by 70 percent, and hazardous-waste production by 40 percent. It also decreased energy consumption by more than 5 percent despite a 40 percent increase in manufacturing output. Even more astounding, the improvements saved \$3 billion. But those achievements were just the start. From 2004 to 2013, DuPont cut air carcinogens by another 65 percent and greenhouse gases by another 25 percent. In addition to continuing to reduce the energy intensity of its operations, the company also made more efficient use of water. That record won DuPont acclaim.<sup>23</sup>

Because operational changes that save money while protecting the environment are win-win, green-management experts consider them "low-hanging fruit." But snagging the fruit still required stretching. In DuPont's case, Woolard was not certain that the company could

<sup>21</sup> Michael J. de la Merced, "DuPont Chief Executive Ellen Kullman to Retire," *New York Times*, 5 Oct. 2015.

<sup>22</sup> Holliday's eco-consultant came to a similar conclusion. See Gilding, *Great Disruption*, 154–55. The green-management literature overwhelmingly stresses the opportunities for improving bottom lines; however, a few scholars have acknowledged that the evidence about the profitability of sustainability initiatives is mixed. See, for example, Rebecca Henderson, "Making the Business Case for Environmental Sustainability," in *Leading Sustainable Change: An Organizational Perspective*, ed. Rebecca Henderson, Ranjay Gulati, and Michael Tushman (New York, 2015), 22–23.

<sup>23</sup> I am rounding the slightly different 2004 figures cited in two sources: Senge et al., *Necessary Revolution*, 126; and Laszlo, *Sustainable Value*, 84. For 2013, see DuPont, *Science Meets Sustainability*, 5.

achieve all his goals, and many employees were skeptical or even resistant. The benefits of footprint-reduction initiatives only became obvious and easily obtainable in hindsight. The biggest obstacle was the long-standing assumption that minimizing pollution necessarily increased the cost of doing business. The pioneering environmental legislation of the 1970s reinforced that view by requiring expensive technofixes, from smokestack scrubbers to wastewater filters. Another obstacle was the expectation that eco-efficiency investments had to provide competitive rates of return. To justify the upfront cost, the savings needed to match the potential gains from other uses of corporate capital.<sup>24</sup>

The skepticism and resistance was most intense on the issue of waste disposal. In the 1940s, DuPont developed a proprietary method for storing hazardous materials in deep wells, and a huge part of the company's Toxic Release Inventory burden came from its reliance on that method, which was both cheap and seemingly benign. Though DuPont never doubted the safety of deep-well injection, Woolard concluded that science alone could not shape waste-disposal practices; the company also needed to take account of public doubts. When he challenged plant managers to find alternatives, some told him that he was not "sufficiently technically trained to understand why this could not be done!" Others just said the cost would be prohibitive. Woolard pushed back: people had to think outside the box. Eventually, engineers devised ways to produce less waste or treat it at a manageable cost. The call to minimize deep-well injection even led to money-saving improvements in operations.<sup>25</sup>

Though leadership was critical, the day-to-day key to footprint reduction was an educational process. From top to bottom, employees had to consider new problems. The learning began with the creation of a corporate environmental plan that ranked measures to cut pollution and waste. Which ones were most cost-effective? Though helpful, that analysis revealed inadequacies in DuPont's accounting methods. The next important discovery was the importance of focusing on potential

<sup>24</sup> Bob Willard, *The Sustainability Advantage: Seven Business Case Benefits of a Triple Bottom Line* (Gabriola Island, BC, 2002), 60, 77; Chris Laszlo and Nadya Zhexembayeva, *Embedded Sustainability: The Next Big Competitive Advantage* (Stanford, 2011), 60–61; Hoffman, *Carbon Strategies*, 97; Doyle, *Trespass against Us*, 238. Woolard called his goals a "stretch." See Smart, *Beyond Compliance*, 196. I discuss the skepticism in the next paragraph.

<sup>25</sup> Ross and Amter, *Polluters*, 135, 138–39; Doyle, *Hold the Applause*, 11, 22–25; Woolard, "Environmental Stewardship," 13; David Shields, Miriam Heller, Devaun Kite, and Beth Beloff, "Environmental Accounting Case Study: DuPont," in *Green Ledgers: Case Studies of Corporate Environmental Accounting*, ed. Daryl Ditz, Janet Ranganathan, and R. Darryl Banks (Washington, DC, 1995), 123–38; Esty and Winston, *Green to Gold*, 158–59. The quotation is from Edgar S. Woolard, "Creating Corporate Environmental Change," *The Bridge* 29 (Spring 1999): 10.

“yield improvements.” If managers thought that paying more attention to the environment might lead to productivity gains, they were more likely to get with the program. By the early 2000s, DuPont had come up with a new metric to inspire creative thinking about how to make operations more sustainable: shareholder value per unit of input. Could the company produce satisfactory returns while using fewer resources?<sup>26</sup>

The greenhouse-gas effort best illustrates the learning process. DuPont quickly realized that most of its climate-change burden came from the manufacture of nylon and refrigerants, not fossil-fuel combustion. The nylon solution fit the classic model; engineering fixes allowed a 90 percent reduction in nitrous oxide emissions at a cost of \$50 million. Because nitrous oxide was regulated by the 1997 Kyoto Protocol, executives justified that expense as a way to meet international standards even though the United States did not sign the treaty. In contrast, the refrigerant problem prompted changes in the manufacturing process that increased its yield, which was a competitive advantage. Emboldened by that experience, managers began to target energy use. That required a greater investment, but the returns were often substantial. The logical follow-up was the creation of a consulting business that helped other companies improve their performance. A cap-and-trade system might have allowed DuPont to do even better, if the company received marketable credits for greenhouse-gas reductions.<sup>27</sup>

Despite the impressive improvements in performance, DuPont continued to have a sizable environmental impact. Inevitably, it did more to solve some problems than others. Some lines of businesses were better positioned to bear added costs. Though many polluting processes might lead to legal liability or loss of goodwill, the risks varied. Was the potential harm far-reaching or limited in scope? If the company did not act to correct a problem, what were the odds that anyone would ever be able to force a reckoning? The likelihood of future regulations might also make a problem a higher priority. But the specific considerations all were part of one overriding question: How much incentive did the company have to go beyond compliance?

The complex obstacles to remedial action are evident in the horrid history of a chemical DuPont bought from 3M for use in making Teflon. The first fateful decisions about C8 came before Woolard's

<sup>26</sup> Woolard, “Creating Corporate Environmental Change,” 11; Shields et al., “Environmental Accounting Case Study,” 123–38; Stephan Schmidheiny and Federico J. L. Zorraquin, *Financing Change: The Financial Community, Eco-Efficiency, and Sustainable Development* (Cambridge, MA, 1996), 70–71; Holliday, “Sustainable Growth”; Paul Tebo, interview with author, Jan. 2016.

<sup>27</sup> Hoffman, *Carbon Strategies*, 92–95, 99–101.

corporate-environmentalism commitment in 1989. In the early 1980s, after 3M warned about possible ill effects from C8 exposure during pregnancy, DuPont barred women from work near the chemical. DuPont also discovered that C8 was detectable in the water supply near its Teflon facility in Parkersburg, West Virginia. Though C8 was unregulated, a group of executives met in 1984 to discuss whether to do more to ensure that it did not contaminate the environment. They assumed that the company's legal and medical departments would urge a halt to C8 use, but they did not consider that position worth debating. The only real discussion concerned two techno-fixes, and the executives rejected both. They worried that the added expense would hurt Teflon sales. They also concluded that preventing future C8 discharges would probably not significantly reduce liabilities if the chemical caused harm, because the company would already be liable for the contamination so far. Neither Woolard nor Holliday reconsidered the 1984 decision despite mounting evidence of C8's toxicity. In the late 1990s, DuPont made the problem worse by secretly dumping the chemical on land acquired from a nearby farmer, whose livestock soon began to suffer from shocking diseases. When the farmer sued, DuPont settled quietly. Then 3M decided to stop making C8, and that forced another critical decision in 2000, early in Holliday's tenure. Instead of working to develop a substitute—a possibility briefly considered and then rejected in the 1990s—DuPont doubled down: it opened a C8 plant in North Carolina. In West Virginia, the company did little to protect drinking water until 2004, when it agreed to build a water-filtration system and to phase out C8 as part of a \$100 million settlement of a class action brought by residents. DuPont and Chemours agreed in 2015 to pay another \$670 million to settle thousands of personal-injury suits there. Now the state of North Carolina is suing for damages as well.<sup>28</sup>

DuPont also has not done enough about “legacy sites”—company facilities that required cleanups. The corporate-environmentalism and sustainable-growth agendas neglected that issue. Though top executives

<sup>28</sup> The most extensive treatment of DuPont's history with C8 is Sharon Lerner's three-part series, “The Teflon Toxin,” *The Intercept* (Aug. 2015 to Sept. 2015), <https://theintercept.com/series/the-teflon-toxin/>. Lerner has reported further on DuPont in a continuing series on “Bad Chemistry,” <https://theintercept.com/collections/bad-chemistry/>. In addition, I am drawing on Nathaniel Rich, “The Lawyer Who Became DuPont's Worst Nightmare,” *New York Times Magazine*, 6 Jan. 2016, <https://www.nytimes.com/2016/01/10/magazine/the-lawyer-who-became-duponts-worst-nightmare.html>; Mariah Blake, “Welcome to Beautiful Parkersburg, West Virginia,” *Huffington Post*, 27 Aug. 2015, <https://highline.huffingtonpost.com/articles/en/welcome-to-beautiful-parkersburg/>; and Roy Shapira and Luigi Zingales, *Is Pollution Value-Maximizing? The DuPont Case* (Stigler Center for the Study of the Economy and the State New Working Paper Series No. 13, Chicago, 2017). Shapira and Zingales have posted key documents online, including a memo about the fateful 1984 meeting: see <https://research.chicagobooth.edu/stigler/research/working-papers/dupont>.

might have set goals for timely remediation of contaminated places, they did not. The benefit of prompt attention to legacy problems was at best intangible: the company might win plaudits for acting responsibly. Financially, however, dealing with past actions was always a drain, not an opportunity, so the overriding goal for managers was minimizing the expense. That was partly a legal challenge. But limiting the burden also involved delaying action as long as possible. Again and again, neighbors and critics have complained that DuPont failed to follow through on cleanup promises.<sup>29</sup>

### Product Development

Though Woolard focused mostly on reducing DuPont's environmental footprint, the company began to develop greener products in the 1990s, and that effort intensified during Holliday's tenure. The new emphasis on sustainability stretched DuPont in many ways. Because the company sold little directly to consumers, it could not easily take advantage of growing demand for green goods. Instead, it needed to persuade other businesses that greener was better. That imperative pushed DuPont to reconsider both product development and marketing.

The easiest step forward was finding green uses for existing DuPont products or expertise. Kevlar—the super-strong, lightweight core of bulletproof vests—increased fuel efficiency in airplanes by replacing heavier structural materials. A DuPont film coating protected solar panels, which incorporated several other company products. So did wind turbines. Tyvek building wrap was tweaked to provide insulation as well as keep moisture out. DuPont also made plastic recycling more effective with the patented Petretec process, which took less energy, could use a greater variety of materials, and produced molecules that retained all their original functionality. As the company boasted, “A popcorn bag can become an overhead transparency, then a polyester peanut butter jar, then a snack food wrapper, then a roll of film, then a popcorn bag again.”<sup>30</sup>

Yet none of those initiatives promised to remake markets. To remain a leader, DuPont needed new engines of growth. The company decided to

<sup>29</sup> Jeff Montgomery and Jeff Mordock, “Chemours Launch Spurs Anxiety over Pollution Cleanups,” *Wilmington News Journal*, 3 July 2015; James M. O'Neill and Scott Fallon, “Toxic Secrets: Pollution, Evasion, and Fear in North Jersey,” *NorthJersey.com*, 14 Feb. 2018, <https://www.northjersey.com/story/news/watchdog/2018/02/14/dupont-pompton-lakes-pollution/806921001/>. O'Neill and Fallon also wrote three other stories for the “Toxic Secrets” series, all published the same day.

<sup>30</sup> Varchaver, “Chemical Reaction”; “Solar Flair,” *DuPont Magazine* 92, no. 2 (1998): 9–11; Hoffman, *Carbon Strategies*, 95, 134. The quotation is from “It Starts with a Little Imagination,” *DuPont Magazine* 90 (Nov./Dec. 1996): 15.

focus on using biotechnology to fashion more sustainable alternatives to mainstays of the economy. In 1995, in partnership with the biotech firm Genencor, DuPont set out to remake the fiber market. By the mid-2000s, when Holliday was in charge, DuPont was preparing to take on the fossil-fuel industry. In 2011, after acquiring Genencor's parent company, DuPont created an Industrial Biosciences division that combined characteristics of both a venture capital firm and a start-up. The new division had to come up with ways of assessing potential investments with highly uncertain returns, and it could not expect to make serious profits for some time. As one executive explained, everything it did was risky.<sup>31</sup>

The development of a partly renewable synthetic fiber was DuPont's beta test of the eco-potential of biotechnology. Though petroleum was still the major ingredient, 37 percent of Sorona derived from corn sugar. Bioengineering made possible a manufacturing process that used less energy and produced fewer greenhouse gases than nylon production. Unlike other fibers, Sorona did not require added chemicals for stain resistance. It also had other qualities that increased its utility and durability. The EPA recognized Sorona's innovativeness with a Presidential Green Chemistry Challenge Award in 2003. When DuPont was finally ready to start commercial production in 2006 after eleven years of development, Holliday dreamed big. Soon people would be buying Sorona carpet, apparel, and much else. "You look at the size of the polyester and nylon markets, and you're talking tens of billions each," he told *Fortune*. "Now I'm not predicting that, but, you know, maybe."<sup>32</sup>

Despite Holliday's hopes, Sorona was slow to take off. In 2017, after a decade on the market, sales were roughly \$300 million. DuPont has had the most success with carpet manufacturers. Mohawk even created a Sorona product line: SmartStrand. In the apparel market, however, stain resistance and durability matter less. Some of the greenest outdoor-wear manufacturers have not bought in. Because Sorona cannot compete on price with commodity fibers—and few consumers are willing to pay a "green premium" for it—DuPont ultimately adopted a marketing strategy that aims to brand Sorona as a luxurious,

<sup>31</sup> Truman Semans and Andre de Fontaine, *Innovating through Alliance: A Case Study of the DuPont-BP Partnership on Biofuels* (Pew Center on Global Climate Change White Paper, Sept. 2009), 26, <https://www.c2es.org/document/innovating-through-alliance-a-case-study-of-the-dupont-bp-partnership-on-biofuels/>. For a timeline of DuPont's biotech initiatives, see "Our History," DuPont website, accessed 21 Feb. 2019, <http://biosciences.dupont.com/our-story/history>.

<sup>32</sup> Varchaver, "Chemical Reaction." Varchaver dates the development of Sorona from 1993, and DuPont might well have begun to think about a greener fiber then. But the joint venture with Genencor began in 1995, so I date product development from that point. For the EPA award, see "Presidential Green Chemistry Challenge Award Recipients by Technology," EPA website, accessed 21 Feb. 2019, <https://www.epa.gov/greenchemistry/presidential-green-chemistry-challenge-award-recipients-technology>.



stylish, and high-performance fabric. Though sales are growing, Sorona seems far more likely to remain a niche product than to become “the next nylon.”<sup>33</sup>

DuPont made an even bigger bet on biofuels—actually, three bets. One was an effort to reengineer corn so that the kernels produced more ethanol. Another aimed to make ethanol from inedible parts of the corn plant. The most ambitious project would use biotechnology to turn plant sugars into a different fuel, butanol, which had many advantages over ethanol. Ethanol had to be transported by rail or truck, but biobutanol could flow through pipelines. It contained more energy—almost as much as gasoline—and it could be blended in higher concentrations. The blending process was more efficient too. Because the technique for making biobutanol allowed the production of other products, the return on investment also did not depend solely on the profitability of renewable fuels. In 2007, a year after DuPont began developing biobutanol, the federal government mandated that 36 billion gallons of biofuels be part of the nation’s annual gasoline supply by 2022. If DuPont could capture a significant part of that market, the payoff would be huge.<sup>34</sup>

Yet biobutanol has struggled. A costly patent battle slowed development until 2015. Though DuPont hoped that a federal climate-change initiative would make gasoline more expensive, that hope came to nothing. The market for biofuels depends on government mandates and subsidies, which so far have not favored biobutanol. That means biobutanol still costs more than both ethanol and gasoline. To build the market, DuPont needs to convince ethanol refiners to retrofit their facilities, and that has been a hard sell despite a program to help early adopters. The retrofits lower refining capacity—and refiners cannot turn the social benefits of biobutanol into higher profits. In 2017,

<sup>33</sup> Maxx Chatsko, “DuPont’s Next Big Idea Could Be Huge for Coca-Cola,” *Motley Fool*, 2 Aug. 2017, <https://www.fool.com/investing/2017/08/02/duponts-next-big-idea-could-be-huge-for-coca-cola.aspx>; Maxx Chatsko, “Investors Beware: 3 Renewable Products that Destroy the ‘Green Premium’ Myth,” *Motley Fool*, 21 Feb. 2015, <https://www.fool.com/investing/general/2015/02/21/investors-beware-3-renewable-products-that-destroy.aspx>; Debra Cobb, “Sustainability Imperatives Drive Textile Innovation,” *Advanced Textile Source*, 22 Dec. 2016, <https://advancedtextilesource.com/2016/12/22/sustainability-imperatives-drive-textile-innovation/>; “Creating a Sustainable Brand,” Brownstein Group website, accessed 21 Feb. 2019, <https://www.brownsteingroup.com/work/sorona/>; “Better Living through Chemurgy,” *Economist*, 26 June 2008, <https://www.economist.com/business/2008/06/26/better-living-through-chemurgy>.

<sup>34</sup> Semans and de Fontaine, “Innovating through Alliance”; Varchaver, “Chemical Reaction.”

DuPont kickstarted production by buying an ethanol refinery, but that facility is barely a drop in the fuel bucket.<sup>35</sup>

Introducing new products is always hard, but DuPont's difficulties with Sorona and biobutanol suggest that the challenge is especially great with goods intended to meet sustainability goals. One problem is basic to capitalism. To avoid environmental damage, manufacturers often need to charge more than competitors. When buyers directly benefit from the greener characteristics, they may happily pay the extra cost. But the new-and-improved qualities of many eco-products do not make life more pleasurable or profitable for their purchasers. Though they lessen pollution or resource depletion or threats to biodiversity, those benefits only matter to the most environmentally conscious. This was true for both Sorona and biobutanol.

Beyond financial constraints, the development of more sustainable products also involves a conceptual challenge that DuPont did not fully appreciate. Sustainability is a complex and contested ideal; nothing is green in every way. As a result, different buyers will choose different trade-offs. They might care more about the environmental costs of the raw materials or the production process or the end life of the product. Sorona is not biodegradable, for example, and that makes it less desirable for some potential users. Because creating a perfectly green product is impossible, manufacturers cannot hope simply to dominate new markets. They are forced to compete in selling their definition of sustainability. They need to argue that the pluses and minuses of their products on balance are better than those of the competition—and in a dynamic market, even if they win that argument today, they might not win it tomorrow.

When DuPont began to develop Sorona, few people were thinking about sustainable fibers, but now fashion experts are writing books on the subject. The choices are bewilderingly varied. The eco-conscious apparel manufacturer Patagonia does not use Sorona, but it uses many other “e-fibers,” including organic cotton, recycled polyester and nylon, hemp, and wood-based lyocell. The market for transportation fuel also is becoming more fraught. DuPont expected that some biofuels would prove to be transitional—that is why it pursued three lines of

<sup>35</sup> Karl Baker, “DuPont Bets on Billion-Dollar Ethanol Industry,” *Wilmington News Journal*, 28 Aug. 2015; Semans and de Fontaine, “Innovating through Alliance”; Maxx Chatsko, “These 2 Big Oil Companies Just Got the Cold Shoulder from the EPA,” *Motley Fool*, 21 Aug. 2014, <https://www.fool.com/investing/general/2014/08/21/these-2-big-oil-companies-just-got-the-cold-should.aspx>; Butamax, “BP and DuPont Joint Venture, Butamax, Announces Next Step in Commercialization of Bio-Isobutanol with Acquisition of Ethanol Facility in Kansas,” press release, 3 Aug. 2017, <http://www.butamax.com/latest-news-updates.aspx>.

development—but it did not anticipate the explosive rise of interest in electric vehicles. Batteries soon may be a better long-term bet than biofuels.<sup>36</sup>

DuPont partly understood that sustainable growth required new perspectives. It invited its Biotech Advisory Panel to critique its research agenda, although that input came after the company already had invested in projects. DuPont also brought in outside expertise to help in product development and marketing. Its big biotech initiatives all were joint ventures with other companies, including BP and Archer Daniels Midland.<sup>37</sup>

That outreach was not enough to make up for DuPont's lack of experience in sustainable design. DuPont did not even do basic life-cycle analyses to understand fully how Sorona and biobutanol would affect the environment; the company was satisfied that both products were steps forward. To have the best chance of profiting from sustainability initiatives, however, executives need to consider alternative paths to a greener future. What are the environmental advantages and disadvantages of different ways to meet needs? Executives also need to think imaginatively and holistically about how society will change over time. The DuPont story suggests that this kind of thinking is hard even for the best-run businesses.<sup>38</sup>

## Public Relations

Convincing people that a company like DuPont could lead the way in protecting the environment was a tough sell. From the early 1960s through the late 1980s, the chemical industry had faced one environmental crisis after another. The publication of Rachel Carson's *Silent Spring*, the revelation at Love Canal of the hazards of toxic waste, the deadly explosion at a Union Carbide plant in Bhopal, India—all put chemical companies on the defensive. Did they care about anything other than profits?<sup>39</sup>

<sup>36</sup> On e-fibers, see Annie Gullingsrud, *Fashion Fibers: Designing for Sustainability* (New York, 2017); and "Materials and Technologies," Patagonia website, accessed 21 Feb. 2019, <http://www.patagonia.com/materials-tech.html>. On the rise of the electric car, see Levi Tillemann, *The Great Race: The Global Quest for the Car of the Future* (New York, 2016).

<sup>37</sup> The biotech panel urged earlier consultation about product development in 2007: see *Biotechnology Advisory Panel: Third Report November 2007* (Keystone, CO, 2007), 13, [http://www.dupont.com/content/dam/dupont/corporate/our-approach/science/documents/BiotechPanelReport\\_2007.pdf](http://www.dupont.com/content/dam/dupont/corporate/our-approach/science/documents/BiotechPanelReport_2007.pdf). In addition to Genencor, DuPont worked with Tate & Lyle on Sorona, with BP on biobutanol, and with Archer Daniels Midland on a new plastic for bottles.

<sup>38</sup> In 2007, DuPont's biotech panel recommended "taking a closer look at total product life cycles and footprints." *Biotechnology Advisory Panel: Third Report*, 15.

<sup>39</sup> For DuPont's worries about its image during this period, see Ndiaye, *Nylon and Bombs*, 224–26. The industry's poor reputation is summarized in King and Lenox, "Industry Self-Regulation," 699.

DuPont had some experience turning public-relations liabilities into assets. In 1980, when a federal proposal to create a hazardous-waste cleanup fund seemed on the verge of defeat, DuPont CEO Irving Shapiro broke ranks with the Chemical Manufacturers Association by arguing that the measure was “rational legislation dictated by the facts,” and his stance was widely hailed: President Jimmy Carter even singled out Shapiro for praise at the Superfund signing ceremony. The 1988 decision to stop producing CFCs before the Montreal Protocol deadline also helped restore the company’s reputation. Though some critics argued that the switch to replacements was long overdue, many commentators hailed DuPont as a problem solver.<sup>40</sup>

But winning acclaim for a few high-profile actions is much easier than demonstrating day-to-day leadership on environmental issues. In order to project a can-do image, managers are tempted to exaggerate progress. They also have incentives to withhold damaging information from the public. Even in companies that recognize the value of openness, that goal sometimes conflicts with a desire to protect competitive advantages.<sup>41</sup>

In 1990, DuPont launched a major advertising campaign that ultimately showed how difficult greening the company’s image would be. The campaign grew out of a relatively small decision. After the Exxon Valdez disaster, Conoco chose to replace two aging ships with double-hulled tankers, which were less likely to spill oil after an accident. Because that decision earned a lot of favorable publicity, DuPont made it the focus of both television spots and magazine ads. The TV spot—“Applause”—showed ducks, dolphins, sea lions, penguins, and whales celebrating Conoco’s decision “to safeguard the environment” while Beethoven’s “Ode to Joy” played in the background. But the ad backfired. Though it made most viewers think more highly of DuPont, it struck some environmentalists as outrageously misleading, and it led to intense scrutiny. Friends of the Earth titled a 1991 study of DuPont’s environmental record *Hold the Applause!* By the mid 1990s, the ad had become a fixture in exposés of corporate greenwashing.<sup>42</sup>

<sup>40</sup> On Superfund, see Philip Shabecoff, “DuPont Official Urges Compromise on Cleanup Fund,” *New York Times*, 20 Nov. 1980; Philip Shabecoff, “Compromise on ‘Superfund,’” *New York Times*, 24 Nov. 1980; and Kinnane, *DuPont*, 214. On CFCs, see Holusha, “Ed Woolard Walks Du Pont’s Tightrope”; and Parson, *Protecting the Ozone Layer*, 156–58.

<sup>41</sup> For an insider’s view of the challenge of establishing a green reputation, see Harrison, *Going Green*.

<sup>42</sup> Doyle, *Hold the Applause*, 1–2, 5–10; Jed Greer and Kenny Bruno, *Greenwash: The Reality behind Corporate Environmentalism* (Penang, Malaysia, 1996), 81–82; Joshua Karliner, *The Corporate Planet: Ecology and Politics in the Age of Globalization* (San Francisco, 1997), 171.

Even if the “Applause” ad had not invited criticism, DuPont would have felt pressure to be more forthright about its environmental performance. A transparency revolution in the late 1980s and early 1990s put industrial corporations in the spotlight. The most direct challenge came from the Council for Environmentally Responsible Economies (Ceres). A group of activists and investors founded in 1989, Ceres asked corporations to accept the Valdez Principles, which included commitments to disclose potentially harmful activities and provide audited reports on efforts to reduce impacts. A number of environmental and corporate-watchdog groups also used the new Toxic Release Inventory data to identify the nation’s worst polluters, and their widely publicized publications forced companies to explain why they did so poorly. DuPont made the inaugural “least wanted” list of the Council on Economic Priorities in 1992 and appeared again in 1993.<sup>43</sup>

DuPont recognized the growing demands for openness but initially sought ways to meet them on its own terms. Like almost every major corporation, it did not affirm the Valdez Principles. But in 1993 it joined with eight other multinational companies to create the Public Environmental Reporting Initiative—a way to create templates for voluntary disclosures. DuPont also issued a “corporate environmentalism progress report” in 1993. In the introduction, Woolard did not try to sugarcoat the company’s record. Instead, he made a plea for patience. He reminded readers that he had first spoken about environmental leadership only four years before, and that change took time. “Some groups continue to direct criticism at ... our past practices,” he wrote. “We ask them to focus on what we are doing now and on the direction we have clearly established for the future.”<sup>44</sup>

During Holliday’s tenure, DuPont went further in trying to win the respect of outsiders. The company shared more material about its environmental performance. It also worked harder to encourage dialogue with those who might challenge the company’s assumptions. The best example is the Biotechnology Advisory Panel, which included ethicists, environmental activists, and academics. Holliday expected the group

<sup>43</sup> Jones, *Profits and Sustainability*, 290–92; “Environmentalists Assess Corporate Pollution Records,” *New York Times*, 9 Dec. 1991; Laszlo and Zhexembayeva, *Embedded Sustainability*, 10–15; “Public Interest and Shareholder Targets: Council on Economic Priorities Names ‘Worst Polluters’ for 1993 – Companies Are 1994 Targets for Campaign for Cleaner Corporations,” *Hank Boerner’s Corporate Governance & Accountability Update* 1 (Winter 1994): 1–3, <http://www.hankboerner.com/library/CorpGovUpdate/CorpGov%20Update%20Winter%201994.pdf>. In addition, see Michael E. Kraft, Mark Stephan, and Troy D. Abel, *Coming Clean: Information Disclosure and Environmental Performance* (Cambridge, MA, 2011).

<sup>44</sup> Hoffman, *From Heresy to Dogma*, 188; “Six Keys to Creating a Winning Environmental Report,” *GreenBiz* (June 2006), <https://www.greenbiz.com/research/report/2006/06/03/six-keys-creating-winning-environmental-report>. The quotation is from Shields et al., “Environmental Accounting Case Study,” 125.

to offer frank opinions, and DuPont posted their reports on the company's website.<sup>45</sup>

DuPont now issues a glossy sustainability progress report as well as detailed reports on climate change, water use, and social responsibility that follow guidelines set by independent entities. The progress reports offer success stories, statements from top executives, and statistics. Though their tone is always can-do, they sometimes address areas for improvement. But the reports are not comprehensive assessments of the company's environmental impact. Instead, they focus on how well DuPont has met its stated sustainability goals. This means they neglect some important issues, especially legacy problems.<sup>46</sup>

Yet the treatment of unresolved problems is a critical test. In the view of many management experts, a sustainable company must be willing to admit mistakes. As Daniel Esty and Andrew Winston argued in *Green to Gold*, "Full accountability is the emerging norm." Holliday acknowledged this. "When you have been making thousands of different products for more than two centuries, there are bound to be legacy issues," he argued. "We accept that society expects transparency and responsiveness on such issues, and we are committed to both in order to earn and keep the public's trust." Unfortunately, DuPont has not always lived up to that standard.<sup>47</sup>

The most egregious failure involved C8. DuPont was able to avoid unfavorable publicity for almost a generation after executives first discussed how to respond to evidence of the chemical's toxicity, but during Holliday's tenure the bomb finally exploded. The 2001 lawsuit led to damaging revelations. Despite agreeing in 2004 to a \$100 million settlement, DuPont continued to deny that C8 threatened public health. In 2005, the EPA fined DuPont for failing to disclose information about the potential hazards of C8, and the record penalty led to more bad press. DuPont dismissed the issue as a misunderstanding about the reporting requirements, but that refusal to admit wrongdoing only invited commentators to conclude that the company was "dishonest" and "uncaring." Then the media largely forgot about C8 for a decade, although a union representing DuPont employees periodically

<sup>45</sup> Sanford, *Responsible Business*, 19–23; Senge et al., *Necessary Revolution*, 128; Holliday, "How Working with NGOs Made DuPont a Better Company"; "Biotech Advisory Board," DuPont website, accessed 21 Feb. 2019, <http://www.dupont.com/corporate-functions/our-approach/innovation-excellence/science/science-and-technology/biotechnology/stewardship/biotechnology-advisory-board.html>.

<sup>46</sup> "DuPont Sustainability Reporting," DuPont website, accessed 21 Feb. 2019, <http://www.dupont.com/corporate-functions/sustainability/sustainability-commitments/performance-reporting/sustainability-reports.html>.

<sup>47</sup> Esty and Winston, *Green to Gold*, 18; Eric Johnson, *Sustainability in the Chemical Industry* (New York, 2012), 112.

tried to draw attention to the issue. But DuPont was rocked again when a public-health study funded by the class-action settlement concluded that C8 caused cancer and other serious health problems. That opened the door to the filing of more than 3,500 personal-injury suits—and set off an explosion of scathing investigative reports about the company's history of deceit. After the *New York Times Magazine* published a devastating exposé in 2016, for example, the newspaper's editorial board condemned DuPont's "unconscionable decades-long efforts ... to hide the dangers of an obscure chemical and bamboozle regulators into allowing toxic pollution to continue long after the dangers were known to the company." Another round of negative stories came when DuPont lost the first damage suits.<sup>48</sup>

DuPont's actions suggest a discomfiting lesson. Market forces are never enough to ensure disclosure of all corporate errors. Even with visible and unarguable disasters like oil spills, companies often might not be fully forthcoming; instead, they might try to deflect responsibility or make just a partial confession, since either course of action might reduce their liability. But when only insiders know about a mistake, honesty almost certainly will not make financial sense. The bottom-line reward for candor is typically small, while the potential benefits of nondisclosure are huge. The problem might never be discovered, or might become an issue far in the future, or might be impossible to pin on the company. Even in the worst case, when a secret history of gross misconduct becomes public, the result is rarely crippling.<sup>49</sup>

## Conclusion

In an unsustainable economy, no business can be truly green. But the potential for eco-improvement varies greatly from company to company. How far, realistically, could DuPont go?<sup>50</sup>

DuPont could not aim to become Patagonia—a privately held company that serves a niche market in the greenest way possible, questions basic attitudes about consumption, and prioritizes sustainability

<sup>48</sup> Johnson, *Sustainability*, 30–31; Leslie Savan, "Teflon Is Forever," *Mother Jones*, May/June 2007, <https://www.motherjones.com/environment/2007/05/teflon-forever/>; "Despite Clear Dangers, DuPont Kept Using a Toxic Chemical," *New York Times*, 12 Jan. 2016; Lerner, "Teflon Toxin"; Rich, "DuPont's Worst Nightmare"; Blake, "Beautiful Parkersburg."

<sup>49</sup> My thinking on this issue owes much to Shapira and Zingales, *Is Pollution Value-Maximizing?* In addition, see Gerald Markowitz and David Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution* (Berkeley, 2013), 300–1.

<sup>50</sup> Though some readers will dispute that our current economy is unsustainable, I am convinced that is true. Many leaders in the sustainable-business community agree. See, for example, Paul Hawken, *The Ecology of Commerce: A Declaration of Sustainability* (New York, 1994), xiv; Yvon Chouinard and Vincent Stanley, *The Responsible Company* (Ventura, CA, 2012), 14–15.

over profit maximization. But the challenge for DuPont was not as great as that for ExxonMobil or Arch Coal—giants in industries that ultimately face extinction. Though critics argue that chemicals derived from chlorine or benzene molecules are inescapably hazardous, DuPont at least could imagine using some of its traditional expertise to reinvent chemistry.<sup>51</sup>

Unlike start-ups, established companies need to consider whether sustainability initiatives will outmode their existing products or infrastructure, but that obstacle was less daunting for DuPont. The company did not depend on one line of business, so it could sell off divisions that might suffer from the company's new focus. Of course, DuPont's divestment decisions were not primarily about avoiding internal contradictions, yet that was one of the benefits. After the sale of Conoco, DuPont could focus on energy-conserving materials and solar- and wind-power components without worrying about the effect on oil prices. The same is true in the fiber market. If Sorona cuts into nylon or polyester sales, that is now a problem for other companies, not DuPont.<sup>52</sup>

DuPont had one other advantage. As a market leader, it had more flexibility than competitors that operated on tighter margins. It could afford to incur extra costs to prevent environmental degradation or invest in sustainability projects with longer-term payoffs. Because Dow and Monsanto also made green commitments in the 1990s, DuPont's CEOs could tell skeptics that advancing an eco-agenda was essential to maintain the company's leading position. But DuPont's flexibility was relative, not absolute. It still needed to meet the expectations of investors.<sup>53</sup>

With strong leadership, DuPont substantially reduced its environmental impact, albeit in some ways more than others. It also worked to develop some forward-thinking products and services. Even the easiest of those accomplishments was not easy. The decision to refocus the company's strategy on sustainable growth was especially bold. Though Holliday's definition of sustainability was expansive enough to

<sup>51</sup> Doyle, *Trespass against Us*, xviii; Rebecca Altman, "How the Benzene Tree Polluted the World," *The Atlantic*, 4 Oct. 2017, <https://www.theatlantic.com/science/archive/2017/10/benzene-tree-organic-compounds/530655/>. Patagonia's commitment to sustainability has attracted considerable attention: for a recent analysis, see Geoffrey Jones and Ben Gettinger, "Alternative Paths of Green Entrepreneurship: The Environmental Legacies of the North Face's Doug Tompkins and Patagonia's Yvon Chouinard" (Harvard Business School Working Paper No. 17-034, Cambridge, MA, 2016), 12–14, 17–18, 21–25.

<sup>52</sup> Kai Hockerts and Rolf Wustenhagen, "Greening Goliaths versus Emerging Davids: Theorizing about the Role of Incumbents and New Entrants in Sustainable Entrepreneurship," *Journal of Business Venturing* 25, no. 5 (2010): 486.

<sup>53</sup> Ross and Amter, *Polluters*, 150.



include pesticides, bulletproof vests, and other goods that did not help to protect the environment, his vision still required a lot of risky moves.

But the rules of the market put formidable obstacles in the way of right action. The failure to account for the true costs of production and consumption, the deference to stockholders, the discounting of the future, the ability of business to withhold information about environmental impacts from citizens, consumers, and public officials—all limited what DuPont could or would do to become greener. Though executives sometimes decided to address costly problems in the hope of preempting regulation or public criticism, doing that too often would have handicapped the company. The market also limited the profitability of many eco investments.

Indeed, Holliday's eco-consultant talked often with top managers about the importance of "changing the regulatory environment in ways that would reward them for being cleaner than their competitors." DuPont tried to do that on the climate-change issue. In debates over cap-and-trade legislation, company lobbyists argued that the market should favor early adopters of planet-saving measures instead of resisters. That argument struck some critics as self-serving: Why should giant corporations expect to reap a windfall? But whatever the merits of the cap-and-trade idea, DuPont certainly was right about how the system worked. Businesses respond to incentives, and too many aspects of the market still penalize environmental leadership.<sup>54</sup>

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<sup>54</sup> Gilding, *Great Disruption*, 153. For the reaction to DuPont's lobbying, see John H. Cushman Jr., "Industries Press Plan for Credits in Emissions Pact," *New York Times*, 3 Jan. 1999; Pooley, *Climate War*, 170.