

Science and Corporate Strategy: Du Pont R&D, 1902 - 1980 by *David A. Hounshell and John Kenly Smith, Jr.*
(Cambridge University Press, New York, 1988), pp. xx + 756, \$99.00, ISBN 0-521-32767-9.

Duco, Cellophane, Nylon, Dacron, Teflon, and Lycra are brand-names that have or are gaining a rare status: that of defining the generic product, in the way that to most of us Kleenex means paper tissues or Esky means an insulated box for carrying food and drink. All six were outcomes of research and development by the Du Pont Company of Delaware, from a massive and diverse programme, which, by the early 1980s, was costing over \$US1 billion. Annual sales in excess of \$US30 billion placed the company among the top three or four chemical manufacturers in the world.

Investment in R&D on such a scale poses questions: how integral has R&D been to the success of Du Pont, and how explicitly has development of the company's R&D capability been tied to broader corporate directions? Hounshell and Smith set out to explore the links between science and corporate strategy in a remarkably comprehensive documentation of Du Pont's R&D in the period 1902-1980. During the five-year project, Du Pont supported their research and gave unrestricted access to the company's records and employees and complete academic freedom. Despite the magnitude of their endeavours, they fail to demonstrate convincingly that Du Pont's R&D and its strategic business decisions were inextricably interwoven.

In 1902, when the Du Pont Company established its first formal research and development facility, it already had seen a century of commercial success as a manufacturer of explosives. The family-owned company had a "tradition of science-based innovation" and was responding to the many recent precedents in the US (largely influenced by developments in Germany) of organised industrial research. The Eastern Laboratory, which operated from 1902 until 1972, and the Experimental Station, opened in 1903 and still in operation, soon demonstrated the commercial value of research, leading the company's Executive Committee to state in 1904 that future permanent success would stem in large measure from R&D. From this first formal declaration arose a tie between R&D and corporate strategy that, although its strength waxed and waned over the next eight decades, has not been broken.

Despite the richness of the data they have mustered, and the implicit uncertainty of their chosen title, Hounshell and Smith have failed to render the links between Du Pont's R&D policy and its corporate strategy transparent to the reader. Mainly this is a consequence of adopting a descriptive, historiographic approach, allowing patterns to emerge from the exquisite detail. It largely is left to the reader to identify and interpret the links and to create the synthesis.

Throughout these eight decades of Du Pont's history, the balance between centralised research, often more fundamental in nature, and decentralised research tied to the various strategic business units, shifted several times. There were recurring switches between relying on internal R&D and obtaining new technologies by acquisition of other businesses. But the strategic basis for this varying emphasis on R&D appears to have been inconsistent. On some occasions the reorganisations and redirections seemed deliberate and proactive components of corporate strategy, while on others they were mainly reactive to events in the

broad economic and political environment. Moreover, the status of R&D at different times depended significantly on the strength of particular personalities within Du Pont.

From 1910 to 1920, R&D was centralised under Charles L. Reese, during a period of major diversification of Du Pont's business. Some of the diversification, particularly into dyestuffs during World War I, was based on internal R&D, but most was achieved through acquisition of other firms, a process which continued until the beginning of the 1930s and which saw Du Pont purchase 15 companies, diversifying beyond explosives into rubber, fibres, fabrics, paints and heavy chemicals. The success of this strategy produced a declining commitment to centralised basic research as the engine for corporate growth. In the early 1920s, the corporation and its research were decentralised into business units based on the acquired business areas. Having a bet each way, management retained a small central Chemical Department (based on the old Experimental Station organisation). This decision, which can hardly be considered consistent with the prevailing corporate strategy, proved critical to the spectacular success of Du Pont in the 1930s.

The decision was consolidated by a renewed strengthening of centralised, fundamental research in the new Purity Hall laboratory in 1927, with "the object of establishing or discovering new scientific facts", in contrast to the decentralised programme of applying "previously known facts to practical problems" (p. 223). The change in emphasis was engineered by the Chemical Department Director, Charles L. Stine, in the absence of any overt reformulation of corporate strategy. Its significance was as dramatic as it was unforeseen; a new focus on polymers led to the discovery and manufacture of neoprene and nylon, the latter the single most important product in Du Pont's history.

Also fortuitously, this reassertion of the value of basic research prepared Du Pont for the drastic changes in its business environment in the 1940s, arising from the two factors — World War II, and a series of anti-trust indictments brought by the Justice Department. They combined to end, for three decades, Du Pont's growth through acquisition, and mandated the company's reliance on its own R&D capability.

Management's tergiversation is evident in the swing back to decentralisation of research during the 1950s without, it seems, an explicit basis in corporate strategy. By the end of the decade, Du Pont appeared to have become disconnected from the innovative forces which drove it through two decades of remarkable success. "In developing a mentality of 'new nylons' . . . managers had forgotten why the company had so easily and swiftly developed nylon . . . the model became skewed" (p. 597).

The largely unsuccessful "New Ventures" programme initiated by the company's President, Crawford Greenewalt, perpetuated the misdiagnosis of Du Pont's ills. It was to be a new phase of diversification, comparable with that after 1910, but based this time on emphasising the development part of the R&D process rather than on acquisition. It is presumed a lode of existing research results waiting to be mined, and overlooked historical evidence of the critical role of basic research in leading the company into new businesses. Research was effectively decoupled from corporate strategy for more than a decade.

In the early 1980s, where this book ends, President Edward Jefferson reasserted the notion that it was "research that gave Du Pont its competitive edge" (p. 591).

The pendulum had swung back, and the result was most evident in the opening of the new Life Sciences laboratory in 1984. In this and in the acquisition in 1981 of the oil company, Conoco, were two major attempts, each representing a separate, deep corporate tradition in Du Pont, to direct the company into new business areas. The Conoco acquisition clearly was strategically driven, and was the culmination of decades of debate about backward integration into petrochemical feedstocks. But the case for rational corporate strategy in the establishment of the Life Sciences lab is less persuasively presented: an article in *The Economist* is credited with providing the spark! The decision had an air of 'me too', since practically every major chemical company in the world moved into biological research in the 70s and early 80s.

Throughout the book it is possible to recognise three forces operating to determine the shape of Du Pont's R&D. Singular external events, most notably the two world wars, profoundly influenced Du Pont's success and prescribed many aspects of its R&D programme. Similarly, public policy in the United States, especially several episodes of anti-trust litigation, served to re-focus Du Pont on fundamental research and obliged it to base its business development on its own R&D results. The third force undoubtedly was the influence, during key periods, of strong and visionary individuals. Some, like Jefferson, operated from positions of power, but others, such as Reese and Stine, cemented the links between R&D and corporate fortunes from positions lower in the Du Pont hierarchy. Hounshell and Smith at different junctures acknowledge the three forces at work, but nowhere do they analyse them closely enough to declare, with conviction, whether the place of R&D in Du Pont's corporate strategy was more than a consequence of these forces. Our feeling, after 600 pages, is that rational, deliberate corporate planning ran a distant fourth.

Is the Du Pont story relevant to corporate behaviour elsewhere, particularly in Australia, where so much concern has been voiced about the private sector's relative underperformance of R&D? Is the low commitment to R&D by Australian companies the result of deliberate corporate analysis and planning or, alternatively, the lack of it? Work at the Centre for Technology and Social Change at the University of Wollongong¹ suggests the latter, at least until recently. In corporations such as ICI Australia, our largest operator in Du Pont's line of business and one of Australia's largest research spenders, are there patterns in the research effort over the years which might be explained by the strength of personality of successive research managers or chief executives, rather than by a process of rational strategic planning? Can we partly attribute the success of, for instance, German corporations, which have a strong commitment to R&D, to the tendency of their senior people to have research or technical backgrounds. Conversely, how many Australian firms have a champion of research at the top, to press the links between R&D and business strategy?

These questions are not easily answered, because there are virtually no data. Bindon & Miller briefly examined one firm, the Colonial Sugar Refining Company,² but other cases of corporate R&D have not been documented. While we may have some reservations about the efforts of Hounshell and Smith, their thorough and detailed compilation provides a superb foundation for further American studies. It will be some time before a comparable resource exists in Australia.

REFERENCES

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A Shield in Space? Technology, Politics and the Strategic Defense Initiative by Sanford Lakoff and Herbert F. York

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This book argues that the Strategic Defense Initiative (SDI) is a classic example of the misplaced faith in the promise of technological superiority. The sub-title provides an accurate summary of the book: "How the Reagan Administration set out to make nuclear weapons impotent and obsolete and succumbed to the fallacy of the last move". There are chapters on; why SDI? the elusive quest for strategic defenses; SDI and strategic stability; arms control and the Western Alliance; deploy or perish; calculating the costs and benefits; and security through technology. The themes of some chapters are captured by provocative headings such as Don't Ask the Soviets, Tell Them; Deploy or Perish; and a Maginot Line of the Twenty-first Century.

President Reagan announced the SDI decision on 23 March 1983: a decision which surprised the technical communities and one which was unique in that it was a Presidential decision without peer review by the defence establishment. The lack of consultation was deliberate, reflecting a Presidential belief that arms control was a hopeless cause and that it was necessary to change attitudes towards defence both within and outside the government. SDI aimed to create a protective shield which promised "assured survival" rather than "assured destruction".

The authors suggest that SDI is technically impossible and economically not worthwhile. Their review of earlier projects to devise strategic defences concludes that such schemes have been costly and largely futile. Generally, any technical advance in defence is only limited and short-lived, usually provoking off-setting offensive improvements by the other side. For instance, the USSR has developed costly defence systems of only marginal utility. With SDI, there are also fears that the future militarisation of space will preclude both arms reductions and civil space co-operation. But their main theme is that there is no last move in the perpetual game of "man against man".

Further chapters examine the USSR fear of SDI as a major acceleration in the technological arms race which would impose additional strains on the Soviet economy; and for the Western Alliance there is concern about the increasing technology gap between the USA and Europe. Consideration is also given to