ESSAY REVIEWS

Recasting the History of Technology in the Netherlands

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Review of: H.W.Lintsen *et al*, ed., *Geschiedenis van de techniek in Nederland. De wording van een moderne samenleving 1800-1890*, vol. 1 *Techniek en modernisering. Landbouw en voeding* (Zutphen: Stichting Historie der Techniek/Walburg Pers, 1992; ISBN 906011-808-1), 320 pp. ill.; vol. 2 *Gezondheid en openbare hygiëne. Waterstaat en infrastructuur. Papier, druk en communicatie* (Zutphen: Stichting Historie der Techniek/ Walburg Pers, 1993; ISBN 906011-836-7), 336 pp. ill.

The word 'Eindhoven' will by now have a familiar ring to habitual readers of *Tractrix*. In volume two, published in 1990, Dick van Lente gave an overview of a large project started at the Technical University of Eindhoven in 1988, which aimed at providing a wide-ranging and thorough analysis of the role of technological change in the modernization process of the Netherlands during the nineteenth century.[1] In an essay review of three Ph.D. dissertations written by members of the 'Eindhoven school', which appeared in *Tractrix* volume four (1992), Nil Disco took the opportunity to vent some skepticism about the possible outcome of the larger undertaking which this selected set of studies was said to prefigure. Disco had his doubts about whether the Eindhoven group would really arrive at 'a comprehensive (and comprehensible) synthesis' on the subject it had so eagerly set out to study. The extent of synergism between the three books under review (or rather the lack of it) hardly gave him any reason to be optimistic on that score.[2]

No sooner had the ink dried on this dissenting message, than the first tome appeared of the multi-volume work that is intended to present the final results of the research conducted by the Eindhoven group during the past few years, entitled *Geschiedenis van de techniek in Nederland. De wording van een moderne samenleving 1800-1890* (History of Technology in the Netherlands. The birth of a modern society 1800-1890). A second tome was published barely six months later. The entire work is scheduled to be completed by the end of 1994. In its final form, the work will consist of six volumes, rather than the mere four

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[1] Dick van Lente, "Technology in Dutch society," *Tractrix. Yearbook for the history of science, medicine, technology and mathematics* 2, 1990, pp. 127-139.

[2] Cornelis Disco, "Tactical innovators or technical reactionaries? Entrepreneurs and industrialization in the 19th-century Netherlands. A review of three case studies," *Tractrix. Yearbook for the history of science, medicine, technology and mathematics* 4, 1992, pp. 93-105.

announced by van Lente, numbering probably some 2,000 pages in all. It will contain a few dozen chapters, which have been written, alone or conjointly, by no less than twenty-eight different authors. Aside from the well-known 'cast' of the Technical University of Eindhoven, consisting of Harry Lintsen, Martijn Bakker, Ernst Homburg, Chiel van Hooff and Geert Verbong, joined by two historians of technology based (or formerly based) at the Erasmus University Rotterdam, Dick van Lente and Johan Schot, the group of contributors comprises people from varied backgrounds, ranging from historians, economists and geographers to chemists, physicians and naval engineers. Overall coordination and editorship of the *Geschiedenis* rests in the hands of the original nucleus from Eindhoven and Rotterdam. It is, in short, not a run-of-the-mill piece of scholarship that is now being completed. This is truly history of technology on a grand scale.

Big structures need strong foundations. Research and publication on this massive scale can of course only be brought to a successful conclusion if the whole effort receives continuous, substantial support. Part of the basis for the project was provided by academic institutions and research foundations where a number of the individual contributors were employed. But a key role in the realization of the work was played by the *Stichting Historie der Techniek* (Foundation for the History for Technology), founded in 1988 on the initiative of the KIvI (Royal Netherlands Institute of Engineers) in cooperation with a dozen other organizations and institutes in the fields of science, technology and management, which succeeded in getting a lot of money as well as a lot of expertise from a host of private individuals, cultural foundations and firms in trade and industry. The historians never had to walk alone.

An important motive for this (by Dutch standards) lavish patronage of scholarship seems to have been the earnest wish on the side of engineering and business circles to advance the cause of the integration of technology into present-day culture. The history of technology is now being conceived as an excellent means to reduce the lack of understanding between technicians and laymen, which is thought to impair modern society. The gap in understanding can be more easily reduced, so the reasoning goes, by showing in detail how present-day technology has emerged and how it has left an enduring mark upon the fabric of daily life and upon the whole evolution of society.[3]

The historians, for their part, have done their shining best to deliver the goods. Although the editors of the series nowhere state it in so many words, they have clearly striven to attain two objects at once, viz. to present their work in such a way that it is fully in keeping with recent scholarship in the history of technology at home and abroad, while at the same time being attractive and

[3] *Geschiedenis van de techniek*, vol. 1, pp. 11, 15.

accessible to the educated layman. The series is thus aimed at reaching a quite broad readership, without making undue concessions to prevailing standards of scholarship.

Texts are mostly written in a plain and limpid style, which is generally free of unnecessary jargon. In order to give readers an even clearer idea of the appearance and significance of the particular technologies involved, each contribution is amply illustrated by pictures, tables, maps, graphs or diagrams in which their diffusion or uses are concisely visualized and, if need be, their workings described in more detail. There are some 280 pictures in the first two volumes alone. The illustrations are generally well-chosen and aptly explained. It is rare indeed to catch the editors in an act of special pleading. The caption on page 18, for instance, where a painting by A. Schelfhout dated 1846 depicting a landscape near Leiden littered with buildings and people, overshadowed by a town and right in the middle intersected by a railway (with a lavishly steaming locomotive to boot), is claimed to represent the 'sparsely populated countryside of Holland' and 'the barely visible railroad', makes one almost suspect that the editors would be equally capable of having a post-card of the Champs Elysées pass for a picture of the Sahara and a snapshot of Central Park for a view of a rain forest. But such minor flaws are exceptional. The style of presentation is on the whole clear-cut, well-considered and appropriate — in short, a model of its kind. Whether it will also help to win for the series the wider readership it intends to reach, is still too early to say, though the fact that the number of subscriptions for the whole series has risen to 2,700 within eight months time certainly augurs well.

What should concern us here above all, however, is the question as to whether the editors have truly succeeded in realizing the scholarly aims they set out to attain and more particularly, whether they have managed to produce a work which is more than the sum of its parts. Does the final product exhibit any 'synergetic effects', or not? It should be stated at the outset, though, that the appearance of the *Geschiedenis* first and foremost deserves admiration and respect. The publication of this magnum opus is an achievement of the first order, which puts every student of the history of technology in the Netherlands in debt of the editors and the *Stichting Historie der Techniek*. 'Eindhoven' will from now on not merely be remembered because of Philips. Secondly, one should realize that comments on the overall structure of the book are in a sense premature, as the later volumes (which promise to look into the interconnections between developments described in the first four tomes) have at the time of writing not yet appeared. This caveat should of course be borne in mind when reading any critical remarks that follow.

As van Lente explained in his *Tractrix* article of 1990, the basic issue addressed

in this work is the role of technological innovation in the modernization of Dutch society during the nineteenth century. In contrast with the three dissertations reviewed by Disco, the contributions in this series deal not only with technologies in industry. Although the concept of technology here is largely (not exclusively) restricted to material artifacts, this formal limitation does not imply a narrow view of the phenomenon itself. The 'Eindhoven' group has not fallen into the trap of reducing the history of nineteenth-century technology to the history of industrialization, as Disco for a brief moment suspected. Non-industrial technologies are included, too. The first two volumes comprise, for example, descriptions of ploughs, dikes, railways, sewers and statistical techniques in public health research.

'Modernization' is taken as a generic term, covering a whole bunch of fundamental changes in society, including the demographic transition, industrialization, urbanization, democratization, the growth of government bureaucracies and the increasing mobility of people and ideas for example. As the editors make clear in their general introduction to the series in volume I, they are keenly aware that this once vastly popular concept has come under heavy fire during the past fifteen years or so, almost to the point of being knocked out of existence. Criticisms were mainly directed against the finalism and ideological prejudice which this specific notion is supposed to embody. The reason why the editors nevertheless have chosen to take 'modernization' as their key concept is their firm belief that the notion, despite all its failings, can still be applied with profit.

The use of the concept has in their view namely three main benefits. First of all, it suggests a kind of criterion for selection. It permits the historian to draw up a hierarchy of subjects. Given the specific big changes in society that pass under the heading of 'modernization', so the argument goes, it is more logical to examine fields of technological endeavour that were somehow crucial in bringing this huge transformation into being than to inquire into technological innovations that apparently had far fewer ramifications for social change. The second benefit that the concept of 'modernization' is supposed to entail, is that it draws attention to underlying relations between innovations in technology and other processes in society. It leads naturally to a search for interconnections. And thirdly, the use of concept invites the making of international comparisons. International comparisons, according to the editors, at the same time allow the historian to get round the danger of ideological prejudice. There is no need in the study of modernization to take a single country (Britain or the US for instance) as an all-time standard by which the performance of all the others have to be measured. The pitfall of finalism might be avoided as well, namely by taking the state of affairs at a particular point in the past (say 1800) as a starting point and then tracing the evolution of specific innovations forwards rather than

backwards.

The editors of the series do not pretend to offer an all-embracing survey of technological change in the Netherlands during the nineteenth century. The present state of research in the history of technology simply does not allow the realization of such a grandiose aim, assuming that it would be worthwhile to pursue it at all. They have chosen to focus on some thirty case-studies instead, grouped in ten large sections. These sections are the same ones as those listed by van Lente,[4] except that the sequence has now been slightly altered. Textiles and clothing (3), gas and electric lighting (5) and building (9) have in the final order been brought together in a separate volume IV rather than included in volumes I, II and III, respectively, as envisaged in the original plan. The volumes under review comprise, apart from the general introduction to the series in volume I, the sections agriculture and food (2), public health (4), waterways and railways (6) and printing, paper making and communication (7).

All sections open and close with an essay composed by a section editor in which the selection of case studies from different sectors is explained and findings about the development of technology are related to the overall process of modernization. Martijn Bakker has written these introductory and concluding pieces for the section on agriculture and food, Eddy Houwaart for the part on public health, Auke van der Woud for the one on waterways and railways and Dick van Lente for that on printing, paper making and communication technology.

The number of case studies per section in the first volumes varies from one to two. In the section on agriculture and food, Bakker has contributed chapters on butter making, sugar processing and (jointly with Harry Lintsen) on corn milling, H. Schippers on beer production, N.H.W. Verbeek on margarine manufacture and Jan Luiten van Zanden on manuring and ploughs. The part on public health consists of chapters by Henk van Zon on public hygiene and Houwaart on statistical techniques in medical research. In the section on railways and waterways, the former theme is dealt with by A.J. Veenendaal, the latter one by A. Bosch and G.P. van de Ven. In the section on printing, paper making and communication technology, Onno de Wit has written pieces on the paper making business and the technology of printing, while van Lente accounted for chapters on techniques of illustration and the market for printed matter, and the two of them together have composed a brief study on a small printing, publishing and bookselling firm at Haarlem, the Erven F. Bohn. Although all case-studies are to some extent based on fresh research, especially in the chapters on beer production, margarine manufacture, paper making and printing that much additional evidence from the archives has been

[4] Van Lente (n. 1), "Technology," pp. 137-139.

used.

These case-studies are mostly designed in a similar way. Each piece starts with a brief sketch of the state of technology at the beginning of the period under study, i.e. around 1800. It then moves on to a description and analysis of the innovations that took place in the course of the nineteenth century. 'Innovations' are throughout this work conceived as processes rather than as finished products. Within these processes, 'invention', 'introduction' or 'diffusion' are taken to be aspects, not separate stages, which thus can occur simultaneously as well as in succession. With few exceptions — like the pneumatic sewage system designed by engineer Charles Liernur (described by van Zon) — all new technologies introduced into the Netherlands during the nineteenth century came originally from abroad. The emphasis in these studies is therefore usually on the ways in which foreign-inspired technologies were introduced, developed and adapted in the particular conditions prevailing in the Netherlands. In the case-study on railways, for instance, Veenendaal points to the specific solutions developed for the construction of railway bridges. In order to explain innovations, the full armour of the contextual approach to the history of technology is brought into battle. The development of technologies is understood as an intricate interplay between actors, networks and systems. And it is of course precisely this contextual approach, that permits authors to relate technological change to the larger social processes subsumed under the heading: 'modernization'.

Seeing that modernization serves as a key notion in the framework of the Eindhoven project, any assessment of the scholarly merit of the series has to take stock of the value of this particular concept. Since so much seems to hinge on this very idea of modernization, it is evidently in order to examine whether the concept is truly as helpful as the editors claim it to be. Is it an efficient beast of burden, or rather just some 'boneless wonder'?

I will not take issue here with the use of the word 'modernization' itself as a covering term to describe big changes in Dutch society during the nineteenth and early twentieth centuries. A term like 'modernization', in my view, may just as well be attached as a label to a particular period in the development of societies in Europe (or the outer-European world) as catchwords like 'Renaissance', 'Reformation' or 'Enlightenment' commonly are to earlier periods in history. The fact that elements of modernization can already be found at various times and places long before 1800 does no more preclude its use as a special tag for the nineteenth and twentieth centuries than the appearance of precursors of the Renaissance in the High Middle Ages, of the Reformation in the fifteenth century, or of the Enlightenment in the seventeenth century does anything to diminish the value of these terms as labels for the periods to which

they are normally being applied. It is equally legitimate to speak of an 'Age of Modernization' as it is to talk of the 'Age of Enlightenment' or of the 'Era of the Renaissance'.

Having said that, I would rather like to concentrate on more substantial issues concerning the employment of the concept 'modernization'. The use of the notion as a key element in the overall framework of the series is after all chiefly defended with the straightforward argument that benefits outweigh costs. At this empirical level of discourse, it is not improper to ask whether the authors have on the one hand really succeeded to reap the benefits which the utilization of the concept is presumed to involve, and on the other hand to avoid the pitfalls which it is equally acknowledged to entail. The point at issue is thus to assess the net gain or loss which its use has produced.

One of the main assets of applying this notion in writing the history of technology of the nineteenth-century Netherlands was, according to the editors, that it suggests a kind of selection criterion. It can serve as a useful aid in setting the agenda for research. The selection of themes for volumes I and II to a large extent can be taken to exemplify this general point. Changes in the manner of food production were an essential part of the social change covered by the term 'modernization' and the choice for examining technological innovations in farming and the food industry thus evidently makes a lot of sense. It is also quite rational, as Bakker argues, to focus inside the food industry on such branches as flour milling, butter making, margarine manufacture, beer production or sugar processing, considering the relatively high degree of application of steam power in these selected sectors by the end of the nineteenth century. Houwaart, van der Woud and van Lente in their introductory and closing essays to the sections on improvements in public health, waterways, railways, printing, paper making and communication technology likewise succeed in making a persuasive case for selecting these fields of technological change as topics worthy of special attention in view of their great importance for the transformation of Dutch society at large. They give the lie to any suggestion that the 'Eindhoven' school only has an eye for industrial technologies.

On closer inspection, however, it turns out that 'modernization' does not in every respect constitute the rigorous standard for selection the editors present it to be. It remains unclear, for instance, why in the section on farming and the food industry the former sector has received a mere eighteen pages (or thirty-five, if we include butter making and sugar-beet growing), while the latter one has been allocated five to ten times as much. Were innovations in farming, or in the conditions of farming, during the period 1800-1890 indeed so much less relevant to the overall change in Dutch society than the introduction of new products and processes in the food industry? Surprisingly, Bakker goes out of his way to defend why farming is dealt with at all; in the original outline the sector

was not even mentioned.[5] He fails on the other hand to explain how the three innovations chosen for more detailed scrutiny (guano, the eagle plough and steam plough) exactly fit into the larger pattern of technological change that he takes to be typical for the agrarian sector, viz. slow but steady change through a myriad of piecemeal adaptations and improvements.[6]

Moreover, one finds no convincing argument why the section on the origin of food has an exclusive focus on the agrarian sector. 'No agriculture no food; no food no society', Bakker declares in a peremptory fashion.[7] No agriculture no food? Tell that to the Eskimo's! People can surely feed themselves in other ways than by eating bread. By eating fish, for instance. Fish may have been a less common item in the diet of Dutch consumers in the nineteenth century than bread, porridge or potatoes, true. Even so, one might have expected an argument why a sector of the economy which was not unimportant for Dutch exports and in the latter half of the century underwent a considerable measure of technological change,[8] has been totally left out of the picture. In fact, the fishing industry does not even get a mention in passing. Other considerations have apparently weighed as heavily in the selection of sectors and allocation of space as the lofty concept of 'modernization'.

The second benefit that this notion is supposed to entail, is that it draws attention to underlying relationships between innovations in technology and other processes in society. Again, the work contains a number of splendid pieces to prove the point — in a certain way, at least. The closing essays to the sections on food production, public health, waterways and railways by Bakker, Houwaart and van der Woud e.g. provide lucid analyses of the ways in which technological change was bound up with such larger processes like market growth, national integration, professionalization and increased government intervention. It is a real pleasure to see various strands of the arguments developed in the previous chapters so elegantly drawn together. These essays also show that the Eindhoven group has indeed kept clear of another danger pointed out by Disco,[9] namely to focus exclusively on decision-making by individual entrepreneurs.

I have the feeling, though, that the possibilities of this kind of second-order analysis have by no means been fully exploited. The advantages of the comparative method have only partially been used. The authors of chapters in different sections seem much more preoccupied with uncovering basic patterns

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[5] *Ibid.*, p. 137.

[6] *Geschiedenis van de techniek*, vol. 1, p. 50.

[7] *Ibid*, vol. 1, p. 39.

[8] H.A.H. Boelmans Kranenburg, "Visserij," in *Maritieme geschiedenis der Nederlanden* (Bussum 1978), vol. 4, pp. 272-301.

[9] Disco (n. 2), "Tactical innovators," pp. 101-102.

in their own particular fields of interest than inquiring into parallels, or variations, with developments dealt with in other sections. Whereas Houwaart for example takes the growth of a network of doctors, engineers, politicians and bureaucrats after c. 1850 as a crucial factor in innovations in public hygiene provisions, and goes at great lengths to describe the formation of this network itself, Bosch and van de Ven in their chapter on schemes for river improvement pay only perfunctory attention to the conditions and mechanisms of power wielding by hydraulic engineers, and never even bother to employ the term 'network' at all. Was the building of networks really less in evidence in hydraulic engineering than in public hygiene? And if so, why? The authors have anyway lost the chance to provide the answer. Synergetic effects between sections have as yet not occurred. Perhaps they will emerge in the last two volumes.

Neither have the authors of the first two volumes made the most of the third presumed benefit of the 'modernization' concept, viz. the opportunity to carry out international comparisons. While all contributors take pains to document the foreign origins of many technological innovations introduced into the Netherlands during the nineteenth century and carefully document the ways in which these were adapted to peculiar local conditions, one rarely finds an extended comparison being made between the pace, manner and extent of the diffusion of foreign-inspired innovations in the Netherlands with the same process in other countries on the Continent like Belgium, Sweden, Denmark or Germany. As a follower and adapter country, the Netherlands is largely treated as a case in itself.

I am also a bit skeptical about the confident assertion by the editors that they have on the other hand really succeeded in minimizing the cost of employing the 'modernization' concept. I am not yet wholly convinced that they have in fact steered clear of the pitfalls which the use of the notion may easily entail. Although the editors have taken great pains to kill off the spectre of finalism by deliberately taking the state of technology around 1800 as a starting point and then following the track of innovations forwards, rather than working from the present backwards, they have not entirely dispelled the impression that 'going modern' in the nineteenth century was somehow the natural thing to do. Whatever sector of technology comes up for discussion, one sooner or later finds oneself amidst a crowd of engineers, doctors, bureaucrats or entrepreneurs all bent on changing a specific production process or transforming the basic conditions of daily life. The forces of modernization figure in these accounts of technological change much more prominently than any countervailing power that may have been in operation.

The cause of this lopsided image is not far to seek. By choosing from the outset to focus on those sectors of technology that made a signal contribution to the

modernization of Dutch society, the editors have at the same time relegated the sectors where change between 1800 and 1890 was much less conspicuous to the non-speaking parts in the play. Inside the sectors subjected to closer scrutiny, agents of change have moreover received far more attention than the forces of inertia or resistance. There are a few cases, to be sure, where groups or institutions that threw obstacles in the way of innovations are duly taken note of. Bakker and Lintsen look into the role of cartels of bakers and operators of wind-powered corn mills in frustrating an attempt to introduce a steam-powered corn mill in Amsterdam in the second quarter of the nineteenth century (vol. I, pp. 81-84). Bosch and van de Ven make mention of the opposition by landowners and draining boards against the schemes for river improvement proposed by a national commission in 1825 (vol. II, pp. 120). De Wit demonstrates how the effort by the firm of van Gelder Schouten & Cie to operate a steam-powered paper mill at Zaandijk around 1835 was crippled from the start by the regulation of the provincial government of Holland — at the behest of owners of nearby wind-powered paper mills — to fire their engine with peat instead of coal (vol. II, pp. 206-207). But the role of interest groups or collusions in retarding the pace of technological change is nowhere addressed in a systematic way. It is perhaps revealing that Bosch and van de Ven add as a kind of afterthought that river improvement had probably both its advocates and opponents, without in effect pursuing the issue much further.

This inattention to countervailing forces is the more to be regretted if one considers developments in the century that preceded the period under study in these volumes. The eighteenth century was after all an era in Dutch history during which the pace of technological change slowed down rather than quickened. What were the factors that made the forces of retardation eventually lose ground, and especially after c. 1830 (as all case-studies here presented appear to evince)? What permitted this ultimate change of gear? This larger issue is addressed in none of the first two volumes. But perhaps it will come up for discussion in one of the later parts of the series. If so, the pitfall of 'modernization' might still be avoided. For the moment, the utility of the concept has not fully been vindicated.

Whatever objections can be raised, the *Geschiedenis van de techniek* remains an impressive achievement. If the guiding concept is not the all-purpose, shockproof tool the editors take it to be, and if the effects of synergy between sections (as distinct from those inside) can as yet not be perceived, the work will nevertheless be able to hold out against any barrage of criticisms or queries, owing to its sheer scope, clear-cut style and attractive way of presentation. Thanks to the labours of the 'Eindhoven' school, the history of technology in the