Hybrid ambitions : science, governance, and empire in the career of Caspar G.C. Reinwardt (1773-1854)

Weber, A

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Governing an Imagined State

The marvelous splendor of commerce, through which shallow statesmen are pitifully blinded, should not make us forget its fleeting nature! One can only consider states as successful and in full secure control of their resources, if they properly apply their national power to bring agriculture to the highest level of perfection that can be achieved.

Annual report of the Gelderland
Committee for Agriculture, 1807.[1]

It must have been a big relief for Reinwardt when he heard about his appointment as professor of natural history, chemistry and botany at the University of Harderwijk. For many academics, the university in Harderwijk was a stepping-stone for better jobs at the academies in Utrecht, Leiden, or Amsterdam.[2] It was in particular his friends in Amsterdam who had actively supported his nomination as successor to Christiaan Paulus Schacht (1767-1800), professor of medicine and botany in Harderwijk since 1792 who had

[1] J. Kops, *Magazijn van Vaderlandschen landbouw* 3 (1807): 53: "De schitterende glans van den Koophandel, waardoor oppervlakkige Staatsmannen te jammerlijk verblind worden, moet ons zijnen korten duur en vergankelijkheid niet doen voorbij zien! Men kan alleen zulke Staten als voorspoedig en in het veilig bezit van hunnen rijkdom beschouwen, daar eene gepaste aanwending van het nationale vermogen den Landbouw tot den hoogsten graad van volmaaktheid brengt, waar voor dezelve vatbaar is."

[2] J.A.H. Bots, "Het benoemingsbeleid van de Gelderse curatoren," in *Het Gelderse Athene. Bijdragen tot de geschiedenis van de Gelderse universiteit in Harderwijk (1648-1811)* (Hilversum: Verloren, 2000), 60-62, and R. Aerts and L. Hoogkamp, *De Gelderse Pallas. Gymnasium Illustre, Gelderse Universiteit, Rijksathenaeum te Harderwijk, 1600-1800* (Barneveld: BDU, 1986), 81.

unexpectedly passed away.[3] Owing to the recommendation of Gerardus Vrolik, director of the botanical garden in Amsterdam, the Harderwijk academic senate eventually accepted Reinwardt's nomination and awarded him an honorary doctorate in medicine and philosophy.

By the time Reinwardt assumed his new position as professor of natural history, chemistry and botany at Harderwijk in 1800, the political landscape in the Netherlands had changed tremendously. After French and Dutch troops had taken power from stadholder Willem V in 1795, the patriots had sparked various initiatives to transform the newly named Batavian Republic into an economically efficient and financially rewarding state.[4] While some patriots argued for a centralized state, others propagated a more federalist structure. The economic situation they faced was, however, challenging. As a result of changing patterns in the world market and the rise of other European port cities such as Hamburg as centres for trade, public debt had risen to almost 500 million guilders in 1794/95.[5] Mounting food prices, continuous interventions and claims by the French government in Paris for assistance rendered the liquidation of the Dutch East India Company (VOC) and the subsequent loss of almost all the colonial possessions in the Malay Archipelago further aggravated the situation.[6]

The reforms initiated by the patriots thus had a wide scope: noblemen as well as prosperous regents lost their hereditary privileges and provinces had to abandon their old names and their political and

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[3] On Schacht, see H. Bouman, *Geschiedenis van de voormalige Geldersche hoogeschool en hare hoogleraaren*, vol. 2 (Utrecht: J.G. van Terveen en Zoon, 1847), 506-508.

[4] For an overview of the complex historiography of this period see, M.J. van der Burg, *Nederland onder Franse invloed. Cultuurtransfer en staatsvorming in de napoleontische tijd. 1799-1813* (Amsterdam: De Bataafsche Leeuw, 2009), 18-24; J. Kloek and W. Mijnhardt, "Vantage point," in *Dutch culture in a European perspective*, vol. 2, *1800: Blueprints for a national community*, ed. Joost Kloek and Wijnand Mijnhardt et al. *(*Royal van Gorcum: Assen, 2004), 15-19, and N.C.F. van Sas, *De metamorfose van Nederland. Van oude orde naar moderniteit, 1750-1900* (Amsterdam: Amsterdam University Press, 2004), 17-39 and 175-94.

[5] J.M.F. Fritschy, *De patriotten en de financiën van de Bataafse Republiek. Hollands krediet en de smalle marges voor een nieuw beleid (1795-1801)* ('s-Gravenhage: Stichting Hollandse Historische Reeks, 1988), 40-41.

[6] M.J. van der Burg, "Transforming the Dutch Republic into the kingdom of Holland: the Netherlands between republicanism and monarchy (1795-1815)," *European Review of History* 17:2 (2010): 151-70; De Vries and Van der Woude, *The first modern economy*, 681-67, and for more details on the political events in Asia, J. van Goor, *Prelude to colonialism. The Dutch in Asia* (Hilversum: Verloren, 2004), 83-98.

administrative independence. On a national as well as on a provincial level, various committees and institutions replaced now defunct administrative entities. To get an exact overview of the current state of the Batavian Republic, the new Executive Committee (*uitvoerend bewind*) appointed several national 'ministers' (*agenten*) for finance, war, the merchant marine, justice, foreign policy, policy and public works, and national education and economy. These agents were asked to compile reliable statistics and to propose concrete measurements to centralize and improve their respective domains. Subordinate bodies were established on a departmental level.[7] In the end, the various surveying projects led to an enormous amount of information and often conflicting plans for revitalizing and further improving the economy of the Batavian Republic and its impoverished possessions in the Malay Archipelago.[8]

This chapter illustrates how the academic Reinwardt became gradually involved in the surveying and reorganization endeavours of the Batavian administrators. By applying his botanical as well as his chemical expertise to the needs of the new state, the former apothecary and chemist proved himself a reliable and efficient aide of the new government. As the chapter will illustrate, his contributions were manifold. As member of the Departmental Committee for Medical Supervision (*Departementale commissie van geneeskundig onderzoek en toevoorzicht)* he helped to improve and standardize the training of future surgeons and apothecaries. As a member of the Committee for Agriculture *(Commissie van landbouw)* he compiled reports on the efficient usage of the natural resources of the department of

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[7] For an overview of the new institutions and committee, see T. Pfeil, *Tot redding van het vaderland.' Het primaat van de Nederlandse overheidsfinanciën in de Baataafs-Franse Tijd 1795-1810* (PhD thesis, University of Amsterdam, 1998), chapter 5; H. Boels, *Binnenlandse zaken. Ontstaan en ontwikkeling van een departement in de Bataafse tijd, 1795-1806. Een reconstructie* (Den Haag: SDU Uitgeverij Koninginnegracht, 1993), 197-264; and Fritschy, *De patriotten en de financiën,* 104-18.

[8] P.M.M. Klep and A. Verheusen, "The Batavian statistical revolution in the Netherlands, 1798-1802. Frequency, formats, administrative success, and political background," in *The Statistical Mind in a pre-statistical era: The Netherlands 1750-1850,* ed. Paul M.M. Klep, et al., 217-40 (Amsterdam: Aksant, 2002), and K.J.P.F.M. Jeurgens, "Een nieuw verschijnsel: enquêtes en registraties door de overheid," in *Noord-Brabant in de Bataafs-Franse tijd, 1794-1814. Een institutionele handleiding,* ed. J.G.M. Sanders, et al., 264-85 ('s-Hertogenbosch: Rijksarchief in Noord-Brabant, 2002). A useful guide through the fragmented archival sources offers K.J.P.F.M. Jeurgens and P.M.M. Klep, *Informatieprocessen van de Bataafs-Franse overheid* (Den Haag: Instituut voor Nederlandse Geschiedenis, 1995).

Gelderland. And eventually he helped Jan Kops (1765-1849), one of the central figures in the new administration, to finish a volume of a splendidly illustrated guide which documented and described all medicinal and other useful plants in the Batavian Republic. As professor in Harderwijk, Reinwardt taught future physicians and apothecaries about how knowledge of chemical processes and medicinal plants could help improve society.

His administrative career allowed Reinwardt to cloak himself in a new identity. This was revealed in two lectures held at the University of Harderwijk. In the first lecture, given right after his appointment in 1800, the former chemist Reinwardt fashioned himself as fearless naturalist who dared to travel through wild nature to detect and harvest medicinal and economically exploitable plants. In the second, after he had resigned as the university's chancellor in 1803, Reinwardt promoted himself as an expert who was able harness the forces of nature to various ends by experimenting with a large number of costly measuring instruments and other chemical hardware both in his expanding laboratory in Harderwijk and in the field. To increase the readership, both lectures were eventually translated into Dutch and published in the Haarlem-based and widely read *Vaderlandsch magazijn van wetenschap, kunst en smaak* (National Magazine for Science, Art and Taste).

Reinwardt's new identity was rooted in a wider political climate where exact measurement, field observation, and travelling were considered core tools for the improvement and rationalization of agriculture, the economy and society. Not only 'naturalists' but also influential revolutionary administrators such as Johannes Goldberg and Jan Kops travelled, measured and observed to transform the fragmented Batavian Republic into a centralized, efficient and unified state. Science and Batavian governance thus appear as closely intertwined and co-evolutionary endeavours.

Surveying and Improving the Batavian Republic

One of the main concerns of the Batavian administrators was the rising public debt. To gain a clearer overview of the country's actual economic situation, the Executive Committee installed Johannes Goldberg as Minister for National Oeconomy in 1798. Goldberg, who formerly earned his living as an insurance broker in Amsterdam, was a fervent supporter of the patriot

movement. An engaged member of various revolutionary committees, he had paved his way for a steep career under the new regime.[9]

Figure 8: Portrait of J. Goldberg by C.H. Hodges, around 1800.

By drawing upon concepts and ideas which cameralists in Germany and physiocrats in France, Britain and Sweden had developed, Goldberg set up a large and centralized survey project in which he combined the accumulation of statistical data with an in-depth analysis of the practices and technologies involved.[10] Together with his aide, Jan Kops, Commissioner for Agriculture (*commissaris van landbouw)*, he developed questionnaires, long lists and tables which they dispatched to the eight new departments of the

[9] W.M. Zappey, *De economische en politieke werkzaamheid van Johannes Goldberg* (Brussel: N. Samson, 1967), 21-25.

[10] H.W. Lintsen, "Het verloren technisch paradijs," in *Geschiedenis van de techniek in Nederland*, vol. 6, *Techniek en samenleving*, ed. H.W. Lintsen (Zutphen: Walburg Pers, 1995), 48. For an overview and contextualization of similar surveying endeavors in Britain and France in the eighteenth century see Drayton, *Nature's government,* chapters 3 and 4, and E.C. Spary, *Utopia's garden. French natural history from old regime to revolution* (Chicago: University of Chicago Press, 2000), chapter 3.

Batavian Republic. Both hoped that engaged local administrators and citizens would fill in the forms and return them to The Hague where their ministry was settled.[11]

Kops, who had studied theology and physics at the Athenaeum Illustre in Amsterdam, was an experienced surveyor.[12] Beside his profession as pastor in Leiden, he had carried out a large agricultural and botanical field survey of the dunes near Katwijk and Noordwijk. His efforts resulted in an extensive report on how these dunes could be transformed into fertile and economically productive farmland. The report came off the press in 1798/99 and comprised not only information about the size of the far-stretched dunes but also about medical plants, animals and trees which Kops and his local helpers had identified in the field. To develop the area, Kops advised his superiors in The Hague to clarify the ownership of the dunes and to establish agricultural colonies where poor and jobless people could be employed.[13]

A brief analysis of Kops' and Goldberg's agricultural survey (*landbouwênquete*) of 1800 sheds more light on the structure and scale of their joint endeavour.[14] The questionnaire, which was based on similar surveys carried out in Sweden, Switzerland, France and England, comprised a total of 253 questions.[15] These were grouped in categories such as farmland, pasture land, treatment of cattle, milk products, forest, fruit trees, vegetable gardens (*moesland*), status of farms and peasants, infertile and waste lands, common land and markets. All respondents were asked to give their names

[11] Van der Woude, "Ontstaan en plaatsbepaling," 15-28.

[12] For more biographical details on Kops see J. Baert, *Jan Kops. Pionier van Hollands landbouw* (*Handelingen en geschriften van het Indisch genootschap te 's-Gravenhage*: Martinus Nijhoff, 1943); and H. Blink. *Geschiedenis van den boerenstand en den landbouw in Nederland*, vol. 2 (Groningen: J.B. Wolters, 1904), 279-81.

[13] Comissie van superintendentie over het onderzoek der duinen, *Tegenwoordige staat der Duinen van het voormalig gewest Holland*, volume 2 (Leiden: Herdingh en du Mortier, 1799), 5-30 and 40-52.

[14] For more information on this survey and transcripts of all answers, see J.M.G. van der Poel, "De landbouwênquete van 1800. I. Noord- en Zuid-Holland," *Historia agricultura.* 1 (1953): 48-194; J.M.G. van der Poel, "De landbouwênquete van 1800. II. Zeeland, Noord-Brabant, Utrecht, Gelderland and Overijssel," *Historia agricultura* 2 (1954): 45-233. J.M.G. van der Poel, "De landbouwênquete van 1800. III. Drenthe, Friesland en Groningen," *Historia agricultura* 3 (1955): 105-76.

[15] J. Kops, "Bijdragen tot de kennis en historie van den vaderlandschen landbouw. Landbouwkundige voorstellen en raadgevingen door onze landgenoten medegedeeld," *Magazijn van vaderlandschen landbouw* 1 (1804): 86-87.

and the altitude and general soil condition their observations were referring to. Questions were for instance:

1. What is the nature of the different lands in the respective district or arrondissement. . . ?
2. Do [these lands] contain marl or other chalk soil [*kalkaardige aarde*]? Where can it be found? . . .
14. What kind of fertilizers are used, which are considered the best, and are [homemade] or purchased fertilizers used?
15. Are chemically produced fertilizers [*konst-mesten*] used?
16. How is the [home-made] fertilizer produced and stored? . . .
81. How are horned cattle, both old and young, bred, fed, and treated in the sheds? . . .
131. Which sorts of trees can be found in the district?
132. On what kind of land are they planted? . . .
150. What kinds of vegetables are cultivated?
151. Are they primarily cultivated for personal consumption? . . .
168. Is drinkable and healthy water for human beings and cattle available? Or is the water brackish and unhealthy?[16]

Since the response to their surveys was rather disappointing, Goldberg and Kops decided to depart on an 'oeconomic' journey (*huishoudelijk reis*) through the Batavian Republic to collect additional data and to observe and

[16] Ibidem, 89-105: "1. Welke is de verschillende natuur der gronden in het district of arrondissement, met de bijzonderheden die daaromtrent mogen plaats hebben? 2. Of er inzonderheid mergel of andere kalkaardige aarde is? En waar die bepaaldelijk gevonden wordt? . . . 14. Welke meststoffen men gebruikt en best bevindt, en of men eigen of gekogte mest gebruikt? 15. Of ook konst-mesten? 16. Hoe de eigen mest wordt vergaard en bewaard? . . . 81. Hoe het hoornvee, zoo jong als oud, aangekweekt, geweid, gevoerd, en op de stallen behandeld wordt? . . . 131. Welke onderscheide boomsoorten bevinden zich in het district? 132. Op welke onderscheide gronden? . . . 150. Welke onderscheide moeskruiden worden er geteeld? 151. Worden die alleen tot eigen gebruik geteeld? . . . 168. Is er goed drinkbaar en gezond water voor mensen en vee? Of brak en ongezond?"

talk to farmers, craftsmen and manufacturers *in situ.*[17] The journey took place between June and November 1800.

In order to communicate their field work to their superiors in The Hague and their fellow-countrymen, Kops and Goldberg later published the results in the form of two travel accounts titled Journal of the Minister for National Oeconomie (*Journaal der Reize van den Agent van Nationale Oeconomie*) and Account Recorded by the Commissioner of Agriculture (*Verbaal gehouden door den Commissaris van Landbouw*). Thanks to the growing publishing industry, the accounts were widely spread within the country. Moreover, travel accounts were at that time a well-established literary genre. Authors of such accounts usually combined personal observation with more general information on agriculture, economy and society of the countries visited. In many cases, their narratives were translated into other European languages. The British 'oeconomic' traveller Arthur Young (1741-1820) and the German Alexander von Humboldt were only the most famous examples to profit from the rapidly growing audience of interested readers in Europe.[18]

Improving Agriculture on a Departmental Level

Beside Kops and Goldberg's survey, the new administrators also initiated the establishment of agricultural committees on a departmental level. Since 1798, the country was divided into eight 'departments'. The new departments had been established in order to break the political authority and independence of the independent seven provinces which had constituted the Dutch Republic, for which reason they were given names unrelated to their predecessor territories; instead they were named Texel, Rhijn, Delf, Dommel, Schelde en Maas, Amstel, Oude Ijssel, and Eems. In 1805 the departments

[17] Zappey, *De economische en politieke werkzaamheid,* 48-52.

[18] The fascinating link between 'scientific' and 'oeconomic' travellers is further explored in Van der Woude, "Ontstaan en plaatsbepaling van de Goldberg-enquête," 16-18. For background information on the 'reading revolution' in the Netherlands see "The printed word," in *Dutch culture in a European perspective*, vol. 2, *1800: Blueprints for a national community*, ed. J. Kloek et al. (Assen: Royal van Gorcum, 2004), 73-92. Von Humboldt's travel account, titled *Voyages aux Régions équinoxiales du Nouveau Continent* came off the press between 1805 and 1834 in more than 30 volumes. On the difficult genesis and reception of this account, see O. Ette, "Der Blick auf die Neue Welt. Nachwort von Ottmar Ette," in *Alexander von Humboldt. Reise in die Äquinoktial-Gegenden des Neuen Kontinents,* vol. 2, ed. O. Ette, 1563-97 (Frankfurt am Main: Insel Verlag, 1991).

were again reconstituted and labelled Drenthe, Friesland, Utrecht, Gelderland, Holland, Zeeland, Overijssel and Brabant. In 1806, the department of Holland was eventually split in a northern and southern part.[19]

According to the general policy, every department received its own committee for agriculture, each usually comprising between six and twelve members. All of them were elected according to their agricultural expertise and political attitude. None of them was paid for their work, though the secretary received a small salary from 1807 onwards.[20]

The tasks of the departmental committees were wide ranging: beside their obligation to advise provincial and national administrators regarding all agricultural issues, they were supposed to collect agricultural and statistical data. Summary reports had to be sent to The Hague in April, August and November every year. Apart from their surveying function, they also travelled through the province and the costs of these tours were later reimbursed.[21] Many of the members visited efficiently managed farms, demonstrated the application of new agricultural tools, or distributed seeds for useful crops and plants among peasants in the countryside. The field work often formed the basis for longer and more visionary reports about how to further improve the output and quality of agricultural products in the department.

In order to increase the cohesion between the members, each committee gathered three times a year in the main place of the respective department. The Friesland committee met in Leeuwarden, the Drenthe committee in Assen, the Overijssel committee in Kampen and Deventer, the Gelderland committee in Zutphen or Arnhem, and the Utrecht committee in Utrecht, the North Holland committee in Alkmaar and Amsterdam, the South Holland committee in Rotterdam and Gouda, the Brabant committee in Den Bosch and Breda and the committee of the department Zeeland in Middelburg and Zierikzee. Once a year, the head of each committee had to report on its work at a general gathering in The Hague.[22]

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[19] E. Koolhaas-Grosfeld, "Charting unification," in *Dutch culture in a European perspective*, vol. 2, *1800: Blueprints for a national community*, ed. J. Kloek et al., 293-302 (Assen: Royal van Gorcum, 2004).

[20] J.M.G. van der Poel, *Heren en Boeren. Een studie over de commissiën van landbouw (1805-1851)*, (Wageningen: H. Veenman & Zonen, 1949), 95.

[21] Ibidem, 82-5.

[22] J. Kops, *Magazijn van vaderlandschen landbouw* 2 (1805): 513-24.

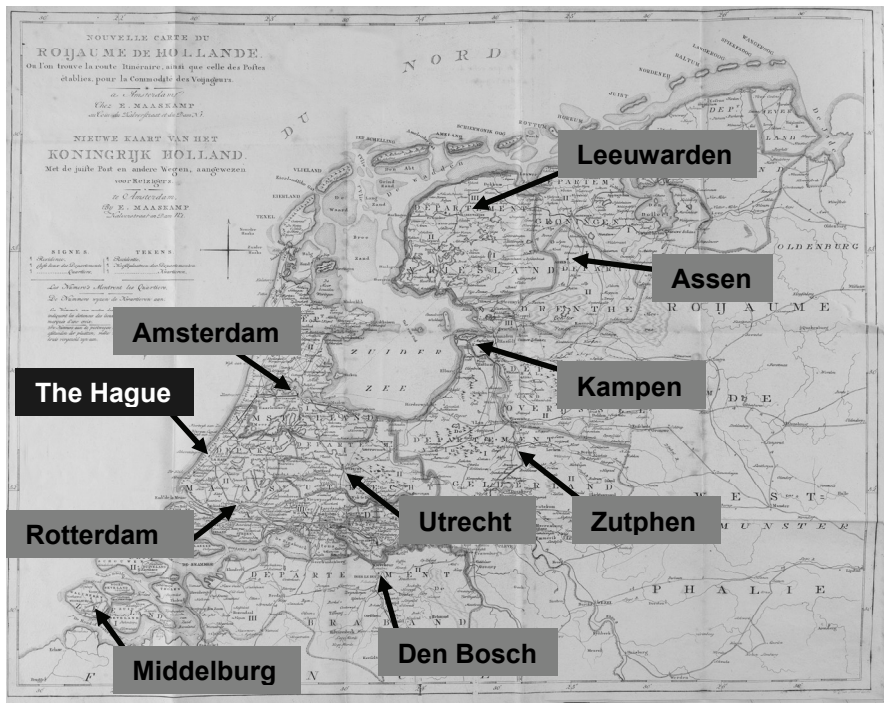

Figure 9: Map showing the places where the departmental Committees for Agriculture held their meetings.

The Gelderland Agricultural Committee

Owing to his botanical and chemical expertise, it is not surprising that Reinwardt was appointed as member of the Gelderland Committee for Agriculture, established in 1805. Owing to its university, Harderwijk was one of the main places of the department. Already in his inaugural lecture at Harderwijk four years before, Reinwardt had promoted the usefulness of surveying and observing agriculture and nature in the field. In the lecture titled "[*A*]*bout the ardour by which practitioners of natural history and botany are driven in their studies*",[23] Reinwardt placed himself in a long tradition of travelling and surveying naturalists who, as he put it, had fostered a desire to investigate nature in the wild with-out fearing the various dangers arising from work in the field. Citing as examples Linnaeus and other well known travelling naturalists such as Conrad Gesner (1516-65), Carolus Clusius

[23] The Latin title of the lecture is *Oratio de ardore quo historiae naturalis et imprimis botanices cultores in sua studia feruntur.*

(1526-1609), Joseph P. de Tournefort (1656-1708), Georg E. Rumphius, Charles Plumier (1646-1704), Albrecht von Haller (1708-77), and Johann J. Scheuchzer (1672-1733), who had explored the Bavarian mountains, the Pyrenees, the Alps, Lapland, Eastern Europe or more remote regions such as French Guyana and parts of Africa, Reinwardt defined 'field' as a primary site where such field work had to be carried out. For as he put it:

> Nature does not reveal her prophecies (*godspraken*) always there, where the one who seeks for advice is looking for it. Her temple is the entire globe, as far as it stretches; it [the globe] has to be traversed entirely by investigators (*onderzoekers*), if they want to know what nature does and produces.[24]

Each country and each region with its specific local circumstances showed a different flora and fauna which had to be thoroughly explored and described by naturalists in order to add new insights to the discipline of Natural History which he defined as follows:

> Natural History aims at collecting, knowing and describing all animals, plants and minerals available around the globe, and giving others the possibility to learn more about these specimens, and the spread of the usefulness which might emerge from it.[25]

In the years to come, Reinwardt's aspirations to travel the world to study nature remained rhetorical. As a member of the agricultural committee for

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[24] C.G.C. Reinwardt, "Redevoering over de onwederstaanbaare drift, met welke de beoëffenaars der natuurlijke historie, en vooral der kruidkunde, tot hunne studie aangezet worden," *Vaderlandsch magazijn van wetenschap, kunsten en smaak* (1803): 821: "[D]e natuur toch deelt hare godspraken niet overal uit, waar de raad vragende zulks mogt begeren. Haar tempel is de geheele aardbol, zo ver die uitstrekt; dezen behooren de natuuronderzoekers overal te doorkruisen, willen zij weten wat de natuur doet of voortbrengt."

[25] Ibidem, 825: "De Natuurlijke Historie heeft ten oogmerk, het verzamelen, kennen en beschrijven van alle op den aardbol aanwezige, dieren, planten en mijnstoffen, het geven van gelegenheid aan anderen om deze voorwerpen te leeren kennen, en het gemeen maken der nuttigheden, die daaruit kunnen ontstaan."

Gelderland, he had to restrict himself to the limited geographical boundaries of the department.

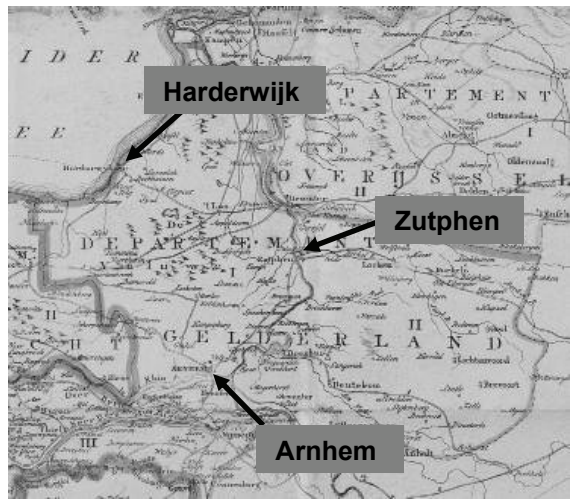

Figure 10: Map of department Gelderland with Harderwijk, Zutphen and Arnhem marked. The Committee for Agriculture held their regular meetings either in Zutphen or Arnhem.

The Gelderland committee consisted in total of eleven members. Some of these men owned large tracts of land and splendid houses. Beside Reinwardt, the administrators of the Batavian Republic engaged the secretary of the city council in Nijmegen Adriaan de Beyer (1773-1843), the owner of an agricultural enterprise in Heerderdal and not long afterwards Governor General of the Netherlands Indies, Herman Willem Daendels (1762-1818), the poet and agricultural 'oeconomist' Antoni Christiaan Wijnand Staring van den Wildenborch (1767-1840), the jurist Herman Jacob Dijckmeester (1771-1850), and the landowners Godefridus F. Hugenpoth tot Aerdt (1743-1819), Frans Godart van Lynden van Hemmen (1761-1845), Arnold Hendrik van Markel Brouwer (1771-1826) and Johan Frederik Willem Spaen tot Biljoen (1746-1827), a former Orangist who presided over the committee. Reinwardt was appointed as temporary secretary of the group.[26]

[26] Bataafsche Staatscourant 35 (1805), 4 November, 1 and GA Arnhem, Commissie van landbouw in Gelderland, 1. Verbaal van het verhandelde van de commissie van Landbouw in het departement Gelderland, eerste zitting, Arnhem, 20 November 1805. For a more detailed analysis of Staring, see H.B. Demoed, "De landbouwkundige activiteiten van A.C.W. Staring," in *A.C.W. Staring. Dichter en landman. Regionalist en nationalist,* ed. J.C. Boogman, 170-89 (Zutphen: Walburg Pers, 1990).

The brief list shows that it was in particular their socio-economic position and their communal allegiance to 'oeconomie' which held the rather diverse group together.

Figure 11: View of Antoni Christiaan Wijnand Staring van den Wildenborch's castle (late 1820s).

The Gelderland committee was a very active group. Already in July 1805, they handed in a long report on agriculture in the province. In their report they welcomed the initiative of the central government in The Hague and emphasized the importance of an efficient domestic agriculture and of processing industries after the Dutch defeat in the Fourth Anglo-Dutch War (1780-84).[27] In order to improve the agricultural situation in the province Gelderland they proposed a broad set of measurements ranging from the abolition of domestic taxes, the economic usage of water and the better exploitation of infertile lands.[28] To support their claim, they referred to the work of British and Prussian 'oeconomists' and geographers such as Anton Friedrich Büsching (1724-1793) and William Tatham (1752-1819).[29]

Büsching, a professor of theology and philosophy at the Georg Augusta University in Göttingen, was the author of various journals and monographs in which he illustrated how statistical and geographical surveys

[27] J. Kops, *Magazijn van vaderlandschen landbouw* 3 (1807): 53.
[28] Ibidem, 32-33.
[29] Ibidem, 42-43, 48.

could improve the economy of a country.[30] Tatham had written a monograph on the economic usage of water for agriculture and commerce. The monograph which came off the press in London in 1801 carried the telling title, *National irrigation, or the various methods of watering meadows; affording means to increase the population, wealth and revenue of the kingdom by an agricultural, commercial and general economy in the use of water*. During the winter months in particular, farmers in Gelderland faced problems controlling water on their corn fields.[31]

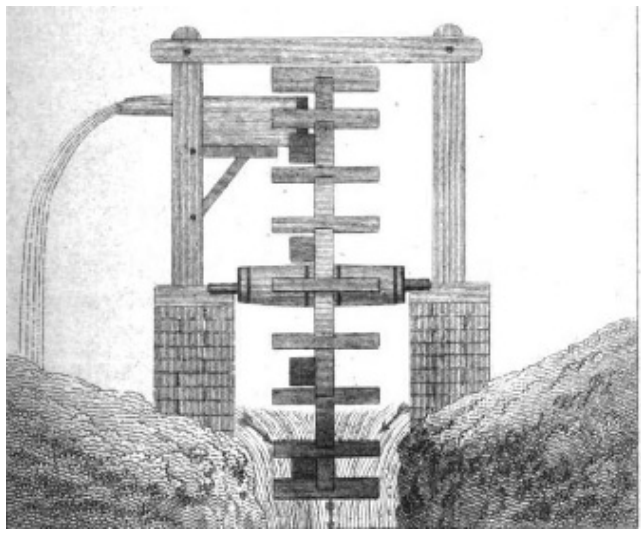

Figure 12: Frontal view of a lifting wheel in Tatham's monograph on the economic usage of water published in 1801.

In April 1806, the heads of the provincial agricultural committees came together in The Hague for the first time. The committees in Groningen, Drenthe, and Brabant had developed a first draft for a veterinary school in their provinces, while the Gelderland committee focused its attention on the taxation of land and the containment of harmful insects and

[30] For a detailed but not well reflected biography of Büsching see P. Hoffmann, *Anton Friedrich Büsching (1724-1793). Ein Leben im Zeitalter der Aufklärung* (Berlin: Berlin Verlag A. Spitz, 2000).

[31] J. Kops, *Magazijn van vaderlandschen landbouw* 4 (1808): 246-48.

worms in their province. Reinwardt and plant expert Adriaan De Beyer (1773-1843) also prepared a longer report on the latter issue.[32]

Reinwardt's and De Beyer's report illustrates the inextricable relationship between 'natural historical' inquiry and the various efforts to improve the administration of the Batavian Republic. In their report, Reinwardt and De Beyer first gave a general overview of the different sorts of bugs and worms that affected agriculture. To get a clearer picture, they advised the members of the different departmental committees to observe and survey the appearance of these vermin in their districts. Such local surveys would contribute to this important part of the department's natural history and it would allow people to learn more about the necessary measurements that had to be applied in case of an unforeseen infestations.[33]

In May 1807, the heads of the departmental committees gathered again in The Hague. One of the central topics during this meeting was the cultivation and exploration of infertile land. The Gelderland committee had submitted a long report dealing with that issue. To proceed with the reorganization and improvement of such areas in their province, the members emphasized the importance of an exact survey comprising all kinds of statistical, geographical, and geological data, to which end they had developed their own questionnaire.[34] . Their survey was finished within a short period of time, and in the same year the committee handed in a long report which comprised at least part of the requested information. Reinwardt contributed brief agricultural surveys of the districts of Harderwijk, Scholt-Ambt van Ermelo, Putten, Nijkerk and Barneveld, all of which were situated in the western part of Gelderland.[35]

The reports and observations of the Gelderland committee and its local collaborators formed the basis of a national report on the current state of agriculture in the Batavian Republic. The first was published in the 1806 issue of the Journal of Domestic Agriculture (*Magazijn van vaderlandschen*

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[32] GA Arnhem, Commissie van landbouw in Gelderland, 1. Verbaal van het verhandelde van de commissie van landbouw in het departement Gelderland, tweede zitting, Arnhem, 3 February 1806.

[33] GA Arnhem, Commissie van landbouw in Gelderland, 1. Verbaal van het verhandelde van de commissie van landbouw in het departement Gelderland, dertiende zitting, Arnhem, 19 May 1807, no. 121.

[34] J. Kops, *Magazijn van vaderlandschen landbouw* 4 (1808): 58-99.

[35] Ibidem, 5 (1810): 27 and GA Arnhem, Commissie van landbouw in Gelderland, 1. Verbaal van het verhandelde van de commissie van landbouw in het departement Gelderland, achtentwintigste zitting, 10 August 1808.

landbouw). The report was divided into three parts. The first section summarized data on environ-mental factors such as temperature, the seasons, wind, rain, and humidity. The second dealt with the cultivation and current state of various crops, such as coleseed, barley, rye, wheat, oat, beans, peas, potatoes. This section also included information on agricultural products such as flax, hemp, tobacco, madder, hop, different sorts of cabbage, vegetables, fruit trees, forest trees, hedges. The third and final section comprised data on pasture lands, the dunes, livestock such as cattle, pigs and cattle, bees, fodder crops, vermin, drainage, veterinary diseases and new products such as wheat with multiple ears, Egyptian barley, and Chinese radish seeds.[36]

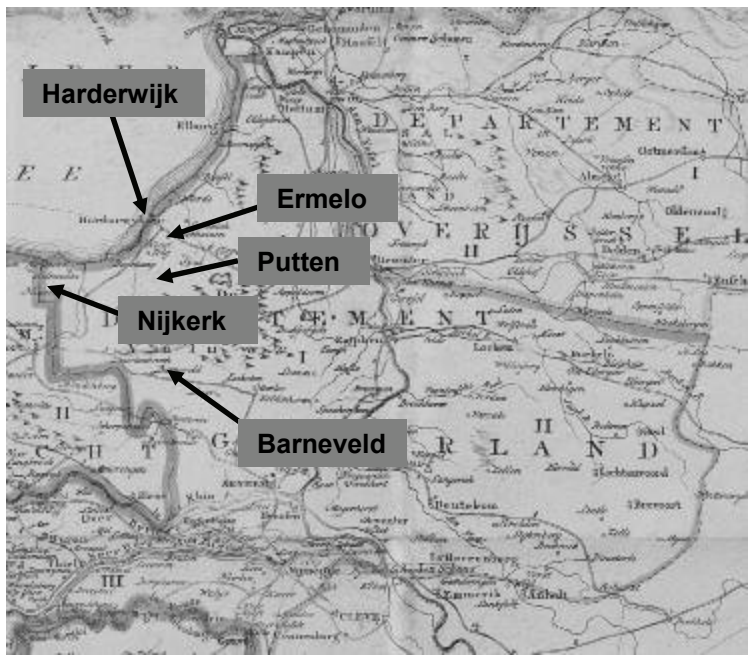

Figure 13: Reinwardt's collecting places in the department Gelderland.

A brief analysis of Reinwardt's botanical activities in Harderwijk has revealed a strong overlap between his claims and practices as an academic in Harderwijk and his function as agricultural surveyor in the department Gelderland. In both realms, Reinwardt observed, described and collected economically useful and medicinal plants and provided data on

[36] J. Kops, *Magazijn van vaderlandschen landbouw* 4 (1808): 249-327.

environmental factors, for all departmental reports which had to be submitted to The Hague had to comprise sections on quantifiable environmental parameters such as weather, humidity, and temperature.

A National Botanical Manual: The *Flora Batava*

Considering what has already been said, it is not surprising that Reinwardt also became involved in another 'useful' project which the commissioner for agriculture Kops had launched in 1800, the so-called *Flora Batava*.[37] In the *Flora Batava,* Kops sought to provide an overview of all the flora in the *Batavian Republic.* Kop's plant descriptions were enriched by illustrations and practical information on the cultivation of edible and other useful plants. In the introduction of the *Flora, Kops* emphasized the usefulness of the botanical compendium, for, as he wrote, it would allow apothecaries, medical doctors, farmers and others to distinguish and identify useful plants in the field. To increase the book's utility and accessibility, all descriptions were written in Dutch and in French. Moreover, the book aimed at standardizing the local nomenclature of plants, or as Kops put it:

> In order to make this study as useful as possible for Dutchmen, I tried my best to settle all confusion regarding Dutch names of domestic plants. Well known and common plants have different names in the various districts of our Republic (*gemeenbeest*) which makes it difficult to refer and point someone to a certain plant in Dutch. It would be highly desirable if each domestic plant carried only one name used in the entire Republic. . . . In this respect, our nation lacks a general language everybody understands: one is thus deprived of all the beneficial effects which emerge by exchanging such expertise.[38]

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[37] For a detailed history of the *Flora Batava* see: M. van Delft, "De 'Flora Batava': het eerste overzicht van de Nederlandse wilde planten in word én beeld," *Jaarboek van het Nederlands Genootschap van Bibliofielen* 6 (1998): 115-143.

[38] J. Kops, *Flora Batava*, vol. 1 (Amsterdam: J.C. Sepp en Zoon, 1800), 2: "Om dit werk voor den Nederlander van het meeste nut te doen zijn, wenschte ik zo veel moogelyk de verwarring wegteneemen, die omtrent de Nederduitsche Naamen onzer Inlandsche Planten overal plaats vindt. De meest bekende en gebruikelijke Planten, hebben in de verschillende oorden en plaatsen van ons Gemeenbest zeer onderscheide benaamingen,

The standardization of indigenous plant names would allow the identification of toxic as well as useful plants. Kops therefore decided to assign only one Dutch name for each plant in the hope that it would be used from that moment onwards.[39]

Figure 14: Portrait of Jan Kops after his appointment as professor for agricultural economy at the University of Utrecht.

In the foreword of the second volume of the *Flora Batava*, published in 1807, Kops thanked various individuals from Nijmegen, Zutphen, Tholen, Rotterdam, Drenthe, and Utrecht who had shared with him their field notes and their knowledge about useful and medicinal plants. Among the contributors one finds provincial administrators, landowners and students.[40] Reinwardt, who at that time had already been appointed as professor of

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waar door het zo moeilyk valt, eene Plant in het Nederduitsch aan anderen kennelijk optegeeven.—Hoogstwenschelijk ware het, dat elke Inlandsche Plant slechts eene Nederduitsche benaming hadt over de geheele Republiek. . . . Onzer Natie ontbreekt in dit opzicht eene algemeene taal, waarin men zich bij ieder kan doen verstaan: men is dus verstooken van alle de heilzame gevolgen, in zijne gevoelens en kundigheden hiervoor aan anderen mededetedeelen."

[39] Ibidem.

[40] Ibidem, vol. 2 (Amsterdam: J.C. Sepp en Zoon, 1807), 1-2.

chemistry, natural history and botany at the Athenaeum Illustre in Amsterdam, is mentioned in the foreword of the third volume. Reinwardt's contribution was twofold. He had translated the Dutch descriptions of plants into French, and he had compiled information on the medical usage of the plants described in the volume. For as Kops put it, his expertise in that field was widely recognized and praised.[41]

Improving Medical Supervision in Gelderland

In addition to his work as agricultural surveyor and contributor to the *Flora Batava*, Reinwardt also became involved with the Departmental Committee for Medical Supervision.[42] As defined in an ordinance of 1804, the tasks of the regional committees were wide-ranging. The members had to control the medical expertise of apothecaries, midwives and surgeons and to survey their daily medical practice. Moreover, they had to inspect the shops of apothecaries and practices of surgeons twice a year. In particular, unexamined practitioners were severely punished. If they were caught they had to pay a penalty fee and had to hand in all their drugs, instruments, and other medical equipment. A second and third violation of the regulations would bring them a confinement of six months, corporal punishment or, even worse, they might be exiled from the Batavian Republic.[43]

The Gelderland committee, which gathered in Arnhem four times a year, consisted of in total twelve members who worked as academics, medical doctors, surgeons, public lecturers and apothecaries in various parts of the department. The committee was presided over by Nicolaas van Lookeren who, after studying in Utrecht, had established himself as a physician in his birthplace, Tiel.[44] Other members, for instance, were Jacob Kopp, Pieter Jacob van Maanen, Johannes van Munster, Gerrit Jan van Wy, Isaac de Bruijn, Otto de Ruuk, Simeon Beverlij Heereford, and J. van Tekelenburg. Kopp had studied medicine in Duisburg and was employed as chief

[41] Ibidem, vol. 3 (Amsterdam: J.C. Sepp en Zoon, 1814), 1.

[42] On the establishment of the Gelderland committee for medical supervision, see J.K. van der Korst, "Gelders verzet tegen de Bataafse gezondheidszorg, 1801-1806," in *Gelre. Bijdragen en mededelingen* 64 (1976/1977): 189-216 and more general A. Querido, *Een eeuw staatstoezicht op de volksgezondheid* ('s-Gravenhage: Staatsuitgeverij, 1965).

[43] D. Cannegieter, *Hondertvijftig jaar gezondheidswet* (Assen: Van Gorcum & Comp N.V.—G.A. Hak & Dr. H.J. Prakke, 1954), 27-30.

[44] On Van Lookeren, see H. van Roijen, "Berigten," *Algemene konst- en letterbode* 29 (1833): 449-56.

physician (*archiater)* in the department Gelderland. Van Maanen was one of Reinwardt's colleagues. Since 1795, he held a professorship for medicine, anatomy and obstetrics at the University of Harderwijk.[45] Van Munster had settled as surgeon and obstetrician in Nijmegen.[46] Trained as a surgeon in Amsterdam, Van Wy held a position as municipal lecturer for medicine, anatomy and obstetrics in Arnhem in 1788.[47] De Bruijn and Beverlij Heereford practiced as physicians in Zutphen and Arnhem.

The Gelderland committee convened in Arnhem for the first time at the end of April 1806. At the first gathering, Reinwardt was asked to develop a plan regarding the examination of apothecaries, surgeons and midwives in the department. The new regulations which Reinwardt developed in the following months were eventually discussed at a second meeting. According to the new rules which were promulgated at the end of this meeting, every apothecary, surgeon or midwife who wanted to settle in Gelderland had to prove that he or she possessed sufficient theoretical and practical skills in his respective profession. New practitioners had to demonstrate their abilities in the form of an examination, to be held in Arnhem four times a year. During the examination, surgeons had to prove that they had worked six years as apprentices and that they were able to carry out difficult operations on living and dead bodies. Midwives had to demonstrate they had attended practical courses and that they had three years of practical experience. Reinwardt, Van Lookeren and Koops were responsible for the examination of apothecaries. Important elements of their examination were their pharmaceutical expertise and their command of Latin. Since the venue where the Gelderland committee met did not possess a chemical laboratory, the apothecaries had to do chemical-pharmaceutical preparations at their own workplace on the day before the exam. Every apothecary, surgeon and midwife who passed the examination eventually received a diploma granting him the right to settle and work in the department Gelderland.[48]

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[45] On Van Maanen, see A. van der Boon, "Levensberigt van Pieter Jacob van Maanen," *Jaarboek van de Maatschappij der Nederlandse Letterkunde* (1855): 40-61.

[46] Anonymous, "Johannes van Munster," in *Biographisch woordenboek der Nederlanden*, vol. 12, part 2, ed. K.J.R. van Harderwijk et. al., 1156-57 (Haarlem: J.J. van Brederode, 1869).

[47] S. Thomas, "*Gerrit Jan van Wy," in Nieuw Nederlandsch biografisch woordenboek*, vol 3, part 3, ed. P.C. Molhuysen, 1493-94 (Leiden: A.W. Sijthoff's Uitgeversmaatschappij, 1914).

[48] GA Arnhem, Archieven van de geneeskundige commissieën in Gelderland. Ordinaire vergadering, 28 and 29 May 1806.

The preceding paragraphs have shown that Reinwardt played a leading role in the committee. He had been asked to develop a new set of rules to improve the examination of future apothecaries, surgeons and midwives right after its establishment. As in other parts of the Batavian Republic, the new rules had a strong empirical component. In particular apothecaries had to demonstrate that they were able to handle various measuring instruments and other chemical hardware to guarantee the quality of the drugs they produced.

Promoting Chemistry in Harderwijk

Considering Reinwardt's emphasis on laboratory training, it is not surprising that he also used the University of Harderwijk as platform to promote such an approach. In the lecture given upon his resignation as university chancellor in 1803, Reinwardt promised his academic audience that an chemistry would help to advance not only public health care but also agriculture, economy and society in the Batavian Republic.

To illustrate and strengthen his claim, Reinwardt distinguished two forms of chemistry: an old form and a new one. While practitioners of the old chemistry, as Reinwardt put it, had only developed rudimentary tools and techniques to analyze and harness nature to various useful ends, 'new' chemists such as the German chemist Georg Stahl (1659-1734), the British physiologists Stephan Hales (1677-1761) and John Mayow (1640-1679), the Scottish physician Joseph Black (1728-1799), the natural philosopher and theologian Joseph Priestly (1733-1804), and the French aristocrat Antoine-Laurent Lavoisier had shifted their analytical focus to an analysis of the reasons underlying natural phenomena. To unravel the hidden forces of nature, these 'new' chemists had instead developed and applied a wide variety of instruments and apparatuses to measure, weigh, analyze, process, split, distil and unite various natural elements such as water, minerals, and gases in their laboratories.[49] Since the intensive usage of instruments allowed them to transcend the limitations of the human senses, the 'new' chemistry would thus, according to Reinwardt, allow to open up entire new fields of natural inquiry.[50]

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[49] Reinwardt, "Redevoering, over de voortreffelijkheid," 191.

[50] The origin and wider implications of the gradual shift from sensual perceptions towards 'exact' measurement within the field chemistry in the decennia around 1800 are discussed in L. Roberts, "The death of the sensuous chemist: the 'new' chemistry and the

Like the French chemist Joseph Louis Gay-Lussac (1778-1850) and his German colleague and friend Alexander von Humboldt, Reinwardt now argued that the application of measurement instruments in the field would allow the formulation of more general laws of nature.[51] In particular, the exact analysis of the composition of metals, stones and soils in the field could shed more light on how the various forces of nature such as wind, water, air and fire had shaped the physical appearance of living things in a certain territory. And, Reinwardt added, among the more promising sites where such an analysis could be carried out were volcanoes—he calls them underground 'fireplaces'—for they continuously affected nature at the earth's surface. Travelling and measuring naturalists thus had the potential, according to Reinwardt, to develop an entirely new and much more holistic vision of nature which was not restricted to raw, ponderous (*log*) and dead nature. By analyzing animals and plants in their natural environment, the 'new' chemistry would rather allow to unravel the deeper causes, interconnections and harmony of nature.[52]

The topics Reinwardt raised in his lecture were not new. French naturalists such as Georges-Louis Leclerc de Buffon (1707-1784), director of the Jardin du Roi in Paris, and Louis Jean-Marie Daubenton (1716-1799) had investigated the impact of environmental factors on plants and animals in their popular work *Histoire naturelle, générale et particulière* (1749-1787). Especially in the years before the French Revolution, theories about the relationship between nature, culture and climate had gained new weight.[53]

During Reinwardt's years in Harderwijk, this rather ambitious agenda remained mere rhetoric. For want of personal funds or a wealthy sponsor, Reinwardt had to limit himself to Harderwijk and the near environs. The only journeys he could afford were within Gelderland or to Amsterdam or Haarlem. In March 1806, he, for instance, informed the head of the

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transformation of sensuous technology," *Studies in the history and philosophy of science* 26:4 (1995): 503-29.

[51] For one of the rare accounts that sheds light Von Humboldt's early interest in chemistry and measuring devices, see P. Werner, *Himmel und Erde. Alexander von Humboldt und sein Kosmos* (Berlin: Akademie Verlag, 2004), 72-88 and more recently: Klein, "The Prussian mining official Alexander von Humboldt".

[52] Reinwardt, "Redevoering, over de voortreffelijkheid," 200.

[53] For an in-depth survey of all these earlier debates, see M.J.S. Rudwick, *Bursting limits of time. The reconstruction of geohistory in the age of revolution* (Chicago: University of Chicago Press, 2005), chapter 3 and Spary, *Utopia's garden,* chapter 3.

Committee for Agriculture that he would not be able to attend the next meeting because of a short sojourn in Amsterdam.[54]

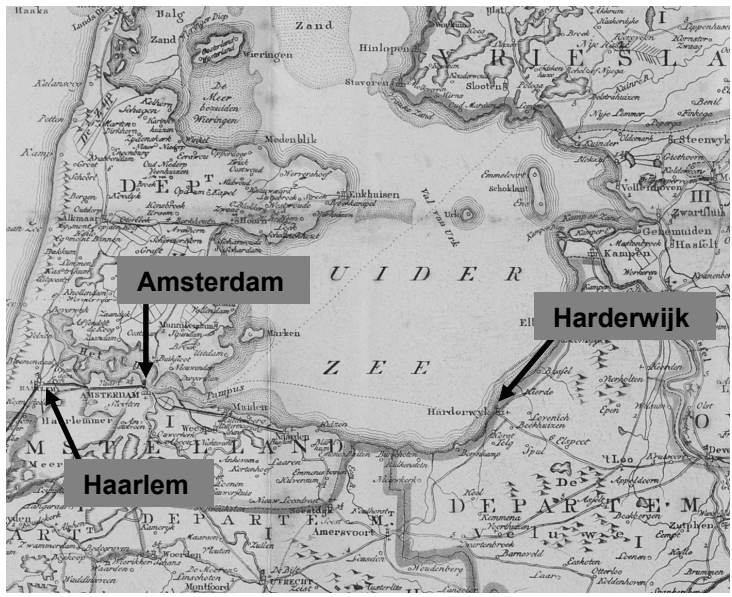

Figure 15: Map of the region between Amsterdam, Haarlem and Harderwijk. Harderwijk and Amsterdam were linked by a direct ship connection.

Reinwardt used such short trips to stay in touch with his brother and old friends, though he sometimes took the opportunity to lecture. In 1803 and 1804, he gave two lectures on chemistry at Concordia et Libertate. In the first, he explained how knowledge of the earth's atmosphere could be used to improve chemical processes in an industrial context. In his second talk, Reinwardt speculated about geological changes of the earth crust.[55]

[54] GA Arnhem, Commissie van landbouw in Gelderland, 1. Verbaal van het verhandelde van de commissie van landbouw in het departement Gelderland, dertiende zitting, Arnhem, 13 March 1806.

[55] The full titles of Reinwardt's lectures were: *Over de invloed onzer tegenwoordige kennis van de dampkring op de voornaamste verschijnselen der natuur en op die menselijke kunstverrichtingen die hieruit alleen kunnen en moeten worden verklaard* (1803) and *Enige gedenkstukken van de ouderdom der aarde en de verbaazende omwentelingen die aan haar tegenwoordige gesteldheid moeten zijn voorafgegaan* (1804).

While a few of his former learned companions now worked on their careers as lawyers, politicians, physicians and academics, many of his apothecary friends faced a sombre future. The majority of them had had to close their small chemical companies, for with the liquidation of the Dutch East India Company in 1800, Amsterdam gradually lost its place as the central 'staple' market in Europe.

In the years to come, Reinwardt thus focused his attention on teaching chemistry and botany to future physicians and apothecaries at the University of Harderwijk. One of the central teaching places was the laboratory, for as he put it in his inaugural lecture, "chemistry does not teach through words but through experiments."[56] The following two sections will shed more light on his teaching practices in Harderwijk, and they will illustrate how his instrument- and experiment-based chemistry gained greater acceptance among apothecaries and academically trained chemists.

Teaching Chemistry in Harderwijk

Unfortunately only a few traces of Reinwardt's teaching practices in Harderwijk remain. What we know for certain is that the laboratory was constantly enlarged and modernized during his tenure so that his students could watch him carrying out experiments with different measuring instruments and other hardware.[57] Though we cannot be certain, it seems likely that his students were also allowed to use the laboratory after the lectures to improve their experimental skills.

According to an inventory made up in 1812, less than four years after Reinwardt had left the university, the laboratory comprised various apparatuses and measuring devices such as a big board displaying the relationships of chemical elements, 24 retorts, 16 flasks, straight and bent tubes, 2 tin pneumatic bins, a distilling vessel (*desteleerketel*), an old oven, a stove (in Boerhaave style), 2 iron pots, 2 dripstones (*leksteenen*), a sprayer (made by the Haarlem physician Martinus van Marum), an anvil, a mortar and pestle, a water fountain, a heater with tubes (*kachel met pijpen*), a set of Florentine oil glasses and white sugar glasses, 4 apothecary bottles, 2 copper

[56] Reinwardt, "Redevoering, over de voortreffelijkheid," 198: "[Z]ij [de scheikunde] onderwijst niet door woorden, maar door proeven."

[57] J.J. Meinsma, "Het scheikundig onderwijs aan de Gelderse Hogeschool (1648-1811) en Rijksathenaeum (1815-1818) te Harderwijk," *Scientiarum historia* 14 (1972): 211-12 and De Vriese, *Reinwardt's reis*, 16.

pans, a set of drugs, 204 bottles with chemicals, a big green bottle with potash, a set of ammonium chloride (*salmiak*) and black manganese (*bruinsteen*), an eudiometer made by the Italian instrument maker Felice Fontana (1730-1805), a smelting machine (*smeltmachine*) by Erhard, a gas machine by Parker, a bell jar with copper spigot, a bottle by Priestly, a new tin helmet, a hammer, a hygrometer scale (*hygrometer schaal*), and a garden house with stove and tubes.[58] In addition, the university owned a long list of physical instruments such as a table air pump, an electrical machine including a Leyden conductor jar, a steelyard, a machine for hydrostatical proofs designed by Willem Jacob 's Gravesande (1688-1742), a hygrometer with strings (*hygrometer van snaren*) and one made of glass, a galvanic pilar (*colom*) with copper and zinc plates.[59]

Following a Disciple: Jacob Vosmaer (1783-1824)

Another source of information about Reinwardt's teaching practices is his disciple Jacob Vosmaer (1783-1824), whom he considered one of his best chemistry students.[60] A brief analysis of Vosmaer's career sheds more light on how Reinwardt taught chemistry in Harderwijk.

Finished a doctoral thesis in the field of chemistry, Vosmaer first settled as a physician in Haarlem and moved later to Zutphen. In 1816, he was appointed professor of chemistry, botany and pharmacology at the University of Harderwijk It is rather likely that Reinwardt recommended him to the university's curators. Later Vosmaer received a similar position in Utrecht.[61]

In 1822, Vosmaer published a handbook for apothecaries with the rather long title: Apothecary's dictionary, or extended overview of pharmaceutical art and all other related sciences, in alphabetical order (*Apothekers woordenboek, of uitvoerig zamenstel der apothekerkunst en daartoe voorbereidende wetenschappen, in eene alphabetische orde*). Vosmaer dedicated

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[58] O.C.D. Idenburg-Siegenbeek van Heukelom, "De laatste jaren der hoogeschool van Harderwijk," *Gelre. Bijdragen en mededeelingen* 37 (1934): 262-63.

[59] Ibidem, 260-62.

[60] For Reinwardt's judgment, see MM The Hague, letter Reinwardt to Meerman, 12 October 1809.

[61] For a short biography of Vosmaer, see H.J. Schimmel, "Jacob Vosmaer," in *Nieuw Nederlandsch Biografisch Woordenboek*, vol. 3, ed. P.C. Molhuysen et al., 1352. Leiden: A.W. Sijthoff's Uitgevers-Maatschappij, 1914 and Meinsma, "Het Scheikundig onderwijs," 214-15.

the book to his teacher Reinwardt. To increase the usefulness of the book he had chosen to order the material in the form of a dictionary. For apothecaries, as he put it,

> by reason of their profession only seldom have the chance to reserve considerable parts of the [working] day explicitly for scientific exercises. For them it is thus more preferable and pleasant to read loose parts than a long concatenated, systematic work whose lecture is repeatedly interrupted by other practical occupations.[62]

Figure 16: Portrait Jacob Vosmaer (1783-1824).

[62] J. Vosmaer, Apothekers woordenboek, of uitvoerig zamenstel der apothekerkunst en daartoe voorbereidende wetenschappen, in eene alphabetische orde. Eerste deel (Zutphen: H.C.A. Thieme, 1822), VIII: "[u]it hoofde van den aard van hun beroep, zelden gelegenheid [hebben], om een aanmerkelijk gedeelte van den dag bepaald tot wetenschappelijke oefeningen af te zonderen. Dit maakt hun het lezen van losse stukken verkieselijker en aangenamer, dan dat van een aaneengeschakeld, systematisch werk, waarvan de lectuur telkens, door allerlei bezigheden wordt afgebroken."

The dictionary thus contained various articles on instruments, pharmaceutical treatments, acids, plants, and even an outline of how pharmacies had to be organized. The articles on 'apothecary' and 'pharmaceutics' (*apothekerskunst*) offer good insight into the self-image of apothecaries and chemists at the time. According to Vosmaer, apothecaries played three different roles: they acted as merchant, civil servant (*staatsbeamte*) and as learned man (*geleerde*). In their function as merchant, apothecaries had to possess enough economic knowledge to manage and organize their small companies. As civil servants, they were bound by the national and provincial decrees and laws according by which the profession was organized. Finally, as learned men apothecaries had to be informed about the latest developments in the fields of botany and chemistry. For the production of drugs required them not only to identify and collect plants in the field but also to separate and combine the active pharmaceutical ingredients of those plants by treating them chemically. Not unlike his teacher Reinwardt, Vosmaer stressed the intimate relationship between chemistry and botany as follows:

> The acquisition of necessary stock induces him again and again to examine a large variety of specimens of nature, in particular plants, from different perspectives; and while preparing and purifying drugs, his workplace continuously lets him face phenomena which invite and sometimes even require him to carry out chemical research.[63]

In the article on the art of producing drugs *(apothekerskunst)*, Vosmaer further specified his view on the profession. Although nature would deliver a large variety of medical plants, only well-trained apothecaries were able to harness the medicinal forces of plants to various useful ends. The ability to control these forces had to be seen as the founding principle of the profession, for "it is only through forces which lay in nature that he can practise his art."[64]

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[63] Ibidem, 159: "De verzameling van zijnen noodigen winkelvooraad geeft hem telkens aanleiding, om allerlei voorwerpen der Natuur, in het bijzonder gewassen, uit allerlei oogpunten te beschouwen; en zijne werkplaats levert hem, bij de bereiding en zuivering der geneesmiddelen, onophoudelijk verschijnselen op, welke hem tot scheikundig onderzoek noodigen, en somtijds zelfs noodzaken."

[64] Ibidem, 160: "[h]et is door de krachten, welke in de natuur liggen, alleen dat hij zijne kunst kan uitoefenen."

In subsequent sections, Vosmaer developed a whole curriculum of competences and practices apothecaries needed to acquire during their training. First of all, apothecaries had to learn to identify and distinguish all natural specimens being found in the wild. Most important were the realms of plants and minerals, for in these apothecaries would find the most important medical ingredients. Moreover, apprentices had to understand the complex chemical relationship and interaction between solids, liquids and gases in order to understand the phenomena which they encountered in their daily work in the laboratory. Vosmaer put it as follows:

> Further he has to understand the underlying relationship and functioning of the elements (*lichamen*), and the forces on which they depend, in order to be able to grasp/comprehend the manifold phenomena which he observes every day and to harness them for his specific art. He will obtain this knowledge through *physics* and *chemistry*.[65]

Beside botanical and chemical expertise, new apprentices had to learn how to apply the knowledge in practice. In order to collect medical plants in the field efficiently, apothecaries had to be able to recognize toxic plants, which often resembled non-toxic variants. Knowledge about the external characteristics of plants was thus obligatory. Moreover, apothecaries had to be informed about the best time to collect different plants, the sites where certain plants could be found and the methods for digging and cutting up plants. Roots for instance had to be harvested in a different way and at a different time of the day than flowers. Another important factor which had to be taken into account was soil, for

> Some crops are most functional on dry soil, others on humid; some in the open field, others if they grow in the shade. For some it is necessary that they occur in the wild

[65] Ibidem, 160-61: "Vervolgens moet hij de onderlinge betrekkingen en werking der lichamen, en de eigenschappen en krachten, waarvan dezelven afhangen, verstaan, om de veelvuldige verschijnselen, welke hij, bij zijne werkzaamheden, dagelijks waarneemt, te begrijpen, en om daarvan, voor zijne kunst, partij te kunnen trekken. Deze kennis zal hij door de Natuur- en Scheikunde verkrijgen."

> and are not artificially cultivated, for others it does not matter or is even much better.[66]

Vosmaer's dictionary was well received by its readers. In the 1823 edition of the National Literary Exercises *Vaderlandsche letteroefeningen* Vosmaer's work was praised for its impartiality and completeness. The extensive list of references to German and French chemical and botanical literature particularly impressed one of his anonymous reviewers.[67] Another reviewer who wrote a short piece for another infuential periodical (*Algemene konst- en letterbode*) came to the same conclusion but thought that the book went beyond the needs of normal apothecaries. The articles on arsenic, vinegar and benzene acids (*benzoezuur*), he maintained, included chemical information more appropriate to the scientific discipline of chemistry than to the more utilitarian practices of apothecaries.[68]

Conclusion

This chapter has shown how Reinwardt became gradually involved in the various surveying and improving endeavours of the new Batavian administrators. As a member of the Committee for Agriculture he carried out field surveys and advised farmers about how to cultivate their lands efficiently. As a member of the Departmental Committee for Medical Supervision, Reinwardt examined the practical skills of apothecaries. As an academic in Harderwijk he instructed his students in the use of measuring devices and other chemical hardware for various useful ends. And he helped one of the central figures in the new administration, Jan Kops, to finish the third volume of his *Flora Batava*, a practical botanical manual for farmers, apothecaries and other plant experts.

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[66] Ibidem, 161: "[s]ommige gewassen zijn het werkzaamst op drooge gronden gegroeid, andere op vochtige; sommige in het open veld, andere als zij in de schaduw staan. Van dezen is het noodzakelijk, dat zij in het wild voortkomen en niet door kunst geteeld zijn, bij genen is dit onverschillig of zelfs wel beter."

[67] Anonymous, review of *Apothekers Woordenboek of uitvoerig zamenstel der apothekerkunst en daartoe voorbereidende wetenschappen* by J. Vosmaer, *Vaderlandsche letteroefeningen* (1823): 596-99.

[68] Anonymous, review of *Apothekers Woordenboek of uitvoerig zamenstel der apothekerskunst en daartoe voorbereidende wetenschappen* by J. Vosmaer, *Algemene konst- en letterbode* 38 (1822): 183-88.

His new status as administrator allowed Reinwardt to cloak himself in a new identity which he developed in the course of two lectures held at the University of Harderwijk. In the first, Reinwardt staged himself as fearless traveller who dared to explore nature in the field for the benefit of the economy, society and agriculture of the Batavian Republic. In the second lecture, he placed himself in a long line of French, German and British chemists who, working in their laboratories, had developed and applied a series of measuring devices to various useful ends. Like naturalists in France and Germany, Reinwardt now hoped that the application of these measuring devices in wild nature would allow scientists to shed light on more general mechanisms and laws that had shaped and still shaped nature and, more particular, agriculture in in the Batavian Republic.

The analysis reveals a strong overlap between the realms of governance and science. Figures such as Reinwardt, Kops and Goldberg drew upon similar practices to gain 'reliable' knowledge about the natural resources of the Batavian Republic. While Kops and Goldberg preferred questionnaires and 'oeconomic' journeys as tools to accumulate such knowledge, Reinwardt considered the application of measuring instruments as an essential means of enriching the 'oeconomic' understanding of nature in the Batavian Republic. The increasing acceptance of *travelling*, *measuring* and *observing* as linked tools thus formed an important step towards the 'well-ordered' and 'well-surveyed' nation state as it emerged in the course of the nineteenth century.

Reinwardt's attempts to establish himself as a scientific and oeconomic traveller received a major twist in June 1808. After Louis Napoleon Bonaparte (1778-1846), king of the Netherlands since 1806, had visited the University of Harderwijk and seen its garden and the chemical laboratory, he decided to engage Reinwardt with immediate effect as director of a royal botanical garden and a menagerie to be established in the vicinity of his royal domain of Soestdijk in Baarn, not far from Utrecht. Reinwardt would receive an annual income of 3000 guilders for his new position as royal gardener, 2000 guilders more than he had earned as professor in Harderwijk.[69] Reinwardt must have been pleased about the new appointment, for he knew that in the second half of the eighteenth century, the Jardin des Plantes (among others around Europe) had served many naturalists as one of

[69] UB Leiden, BPL 2425, 3, Royal decision, 28 June 1808.

the few platforms from which to launch their careers in the field.[70] The following chapter will show that for Reinwardt, the Dutch Jardin du Roi was a rather fragile starting point. Owing to the short reign of Louis Napoleon, Reinwardt had to find other ways to secure his status in a time of political and institutional instability.

[70] For a deeper analysis of the complexity of such careers in eighteenth century France, see E.C. Spary, "The 'nature' of enlightenment," in *The sciences in enlightened Europe*, ed. by William Clark, et al. 272-304 (Chicago: University of Chicago Press, 1999).