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

Weber, A

Hybrid Ambitions

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Hybrid Ambitions

Science, Governance, and Empire in the Career of Caspar G.C. Reinwardt (1773-1854)

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Meinen Eltern gewidmet

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Andreas Weber

Leiden, 4 March 2012

Introduction

In December 1814, Caspar Georg Carl Reinwardt (1773-1854), professor of chemistry, botany and natural history at the Athenaeum Illustre in Amsterdam, received the following letter from Anton Reinhard Falck (1777-1843), secretary of the Dutch king Willem I:

> It is time that we compensate for the harm we have inflicted on ourselves and the learned world. We should no longer miss the merits of knowing our colonies as thoroughly as our neighbours do. Java alone will give us the opportunity for important observations and discoveries regarding all realms of nature. . . . We need a man who unites shrewdness and broad expertise, and who has been working in the most prominent fields of science for years, and whose diligence will not be deterred and stymied by difficulties.[1]

[1] UB Leiden, BPL 2425, inv. 20. Letter Falck to Reinwardt, 13 December 1814: "Het is tijd dat wij de schade vergoeden aldus aan ons zelven en aan de geleerde wereld toegebracht. Ons moet niet langer de verdienste ontgaan van onze koloniën even grondig te kennen als onze naburen de hunne. Java alleen zal in alle de rijken der natuur tot de belangrijkste waarnemingen en ontdekkingen aanleiding geven. [. . .] Er is een man nodig, die aan groote scherpzinnigheid veel omvattende kundigheden paart en eene veeljarige beoefening der voornaamste wetenschappen, wiens ijver niet door gewone zwarigheden verdoofd en afgeschrikt worde . . . ".

In the succeeding paragraphs, the secretary revealed that Willem I (1772-1843) considered Reinwardt the most suitable person to investigate the Dutch colony in the East. Reinwardt, who in 1814 had already turned forty-two, initially doubted whether he really wanted to take on this challenge. Only after having expressed his reservations, he accepted the king's offer in a letter dated 26 December 1814, mentioning the generous financial prospect and the predictable scientific honours:

> The available knowledge of the inhabitants, . . . the land, and the great variety in nature of those countries [the Malay Archipelago] is too incomplete, further research would lead to new findings which would contribute to the enhancement of scientific knowledge in general as well as to the opening up of new exploitable resources, trade and prosperity. . . The one who first takes up this career will probably already reap the rewards . . . of important discoveries.[2]

Immediately after Reinwardt's confirmation, preparations were made for his trip to the Malay Archipelago. During his six-year stay in the Netherlands Indies, Reinwardt travelled to the interior of Java and carried out a large sea expedition to the Lesser Sunda Islands, the Moluccas and Celebes. The hinterlands of the Dutch settlements on these islands had remained terra incognita to European naturalists and colonial administrators.[3]

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[2] W.H. de Vriese and J. Pijnappel (eds.). *Reinwardt's Reis naar het oostelijke gedeelte van den Indischen Archipel, in het jaar 1821* (Amsterdam: Frederik Muller, 1858), 30. Letter Reinwardt to Falck, Amsterdam, 26 December 1814: "De kennis welke wij tot nogtoe van de inwoonderen, de gesteldheid en den aard der gronden, derzelver voortbrengend vermogen en van de groote verscheidenheid der natuurlijke voortbrengselen dier landen bezitten, zijn te onvolledig, dan dat men zich niet van verdere nasporingen daaromtrent nog vele ontdekkingen beloven konde, die ter uitbreiding van wetenschappelijke kennis in het algemeen, zoowel als ter opening van nieuwe bronnen van bedrijf, handel en welvaart dienstig zijn zullen; en ook hij die het eerste deze loopbaan betreedt, zal misschien reeds de vruchten kunnen oogsten, die het loon zijn van belangrijke ontdekkingen, en de drijfveer en het doel van wetenschappelijk onderzoek."

[3] Ch. Jeurgens, "Op zoek naar betrouwbare informatie. De commissarissen-generaal en de stichting van de koloniale staat, 1816-1819," in *Het verre gezicht. Politieke en culturele relaties tussen Nederland en Azië, Afrika en Amerika*, ed. J. Thomas Lindblad et al. (Franeker: Uitgeverij van Wijnen, 2011), 266-85; E. Tagliacozzo, *Secret trades, porous borders. Smuggeling and states along the Southeast Asian frontier, 1865-1915.* (New Haven:

When Reinwardt eventually left Batavia in 1822, Willem I had already approved the foundation of a special committee, the Committee for Natural History of the Netherlands Indies (Natuurkundige Commissie voor Nederlandsch-Indië) to continue Reinwardt's field work in the far-flung Archipelago.

Until its dissolution in 1850, the members of the committee explored various parts of the Malay Archipelago. Heinrich Kuhl (1797-1821), Gerrit Laurentius Keultjes (1786-1821), Johan Conrad van Hasselt (1797-1823), Heinrich Boie (1794-1827), Heinrich Christian Macklot (1799-1832) and Pierre-Médard Diard (1794-1863) specialized in the collection, description and preparation of animals, minerals and plants and investigated the environs of Batavia and the western parts of Java in the 1820s. Macklot, the gardener Alexander Zippelius (1797-1828), the draftsmen Pieter van Oort (1804-1834), and the taxidermists Gerrit van Raalten (1797-1829) and Salomon Müller (1804-1864), for example, set out on board of the navy corvette *Triton* for a large sea expedition to New Guinea, Timor, Celebes and Amboina in 1827. Their research was later continued by the bird collector Eltio Alegondas Forsten (1811-1843) and Heinrich von Gaffron (1813-80). In 1833, Müller and the botanist Pieter Willem Korthals (1807-1892) travelled to the Padang region on Sumatra's west coast to carry out natural historical research. Later Ludwig Horner (1811-1838) and Carl Anton Ludwig Maria Schwaner (1817-1851), both geologists, were sent to explore the interior of Borneo, the biggest island in the far-flung Malay Archipelago. Many of these travellers relied on the growing infrastructure of the Royal Dutch Navy in the region.[4]

Yale University Press, 2005), 29; and E. Tagliacozzo, "The lit archipelago. Coast lighting and the imperial optic in insular Southeast Asia, 1860-1910," *Technology and culture* 46:2 (2005): 306-28.

[4] For more details on these individuals and their fieldwork in the region: Ch. Klaver, *Inseparable friends in life and death. The life and work of Heinrich Kuhl (1797-1821) and Johan Conrad van Hasselt (1797-1823), students of prof. Theodorus van Swinderen* (Groningen: Barkhuis, 2007); T. Hildenhagen, "Das kurze Leben des Dr. h.c. Heinrich Kuhl (1797-1821) und seine herpetologischen Beiträge," *Sekretär* 10:2 (2010), 40-59; R. Barnes, "Recording cultures. Collecting in eastern Indonesia," in *Colonial collections revisited*, ed. Pieter ter Keurs (Leiden: CNWS, 2007), 203-19; C.H.J.M. Fransen, L.B. Holthuis, and J.P.H.M. Adema, "Type-catalogue of the Decapod Crustacea in the collections of the Nationaal Natuurhistorisch Museum, with appendices of pre-1900 collectors and material," *Zoologische Verhandelingen* 311 (1997): 270-5; M.J. Sirks, *Indisch natuuronderzoek. Een beknopte geschiedenis van de beoefening der natuurwetenschappen in de Nederlandsche koloniën* (Amsterdam: Koloniaal Instituut,

Figure 1: View on board the navy corvette, *Triton,* sailing to New Guinea in May/June 1828. The drawing on which the lithograph is based was made by Pieter van Oort, one of the draftsmen of the Natuurkundige Commissie.

The aim of those early survey operations was twofold. On the one hand, Reinwardt and the members of the Committee for Natural History had to serve the emerging colonial state which aimed at the exploitation of the overseas possessions.[5] They were thus regularly instructed to help the colonial authorities find practical and feasible solutions to pressing issues such as the production of saltpetre, the minting of silver coins, the

1915), 86-140; M.J. van Steenis-Kruseman, *Cyclopaedia of Malesian collectors*, accessed May 6, 2011, http://www.nationaal herbarium.nl/fmcollectors/Home.htm; H.J. Veth, *Overzicht van hetgeen, in het bijzonder door Nederland, gedaan is voor de kennis der fauna van Nederlandsch-Indië* (Leiden: Van Doesburgh, 1879). For an overview of the infrastructure and mapping projects of the Dutch navy in the Netherlands Indies see J.M. Mohrmann, "De Koninklijke Marine als vernieuwer van de zeevaartkunde, 1850-1900," *Tijdschrift voor Zeegeschiedenis* 22:1 (2003): 44-58.

[5] W. van den Doel, *Zo ver de wereld strekt: De geschiedenis van Nederland overzee vanaf 1800.* (Amsterdam: Bert Bakker, 2011), 15-94; M.C. Ricklefs. *A history of modern Indonesia since c. 1200* (Stanford, California: Stanford University Press, 2001), 143-89; Th. Stevens, *Van der Capellen's koloniale ambitie op Java. Economisch beleid in een stagnerende conjunctuur, 1816-1826* (Amsterdam: Historisch Seminarium van de Universiteit van Amsterdam, 1982), chapter VIII.

organization of the school and health systems, the introduction of standardized weights and measures, the cultivation of various cash crops, and the detection of natural resources such as gold and coal. Moreover, some of them were asked to map unprospected peripheral regions and to gain statistical information on the societies they encountered in the field. On the other hand, Reinwardt and the members of the Committee for Natural History acted as collectors for the National Museum of Natural History ('s Rijks Museum van Natuurlijke Historie) and the National Herbarium ('s Rijks Herbarium).

The National Museum and the National Herbarium were both founded in the 1820s. Since Willem I sought to establish his new kingdom as one of Europe's leading powers, both institutions were intended to illustrate and manifest the scientific pride and glory of his monarchy.[6] To compete with similar institutions in Paris, London, Berlin, Geneva, and Vienna, the directors of the National Museum of Natural History and the National Herbarium quickly set up a vast network of collectors which covered Europe, the Gold Coast in West Africa, South Africa, Egypt, Japan, North and South America and, most important, the Dutch possessions in Asia, which owing to their rich biodiversity, formed a wealthy source for the expanding natural historical collections in the Netherlands.[7]

The large survey and collecting operations of Reinwardt and the members of the Committee for Natural History formed the basis for the rising reputation of the Dutch kingdom as a well-known centre for natural historical research in Europe in the nineteenth century. Large numbers of boxes with natural historical specimens, diaries, field notes, sketches and illustrations reached Leiden in the first half of the nineteenth century and

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[6] R. Effert, *Royal cabinets and auxiliary branches. Origins of the National Museum of Ethnology, 1816-1883* (Leiden: CNWS, 2008), 17-22. For Willem I's political ambitions, see N.C.F van Sas, "Het grote Nederland van Willem I: een schone slaapster die niet wakker wilde worden," in *Staats- en natievorming in Willem I's koninkrijk (1815-1830)*, ed. C.A. Tamse, et al. (Brussel: Vubpress, 1992), 171-85. For a comparison of the museums in France, Britain and the Dutch Kingdom, see R. Langebeek, "Les musées d'histoire naturelle de Leyde, Paris et Londres. Analyse de l'évolution et du mode d'exposition des objets de musées d'histoire naturelle jusqu'aux premières années du XIX siècle" (PhD diss., Muséum National d'Histoire Naturelle, Paris, 2010).

[7] For an overview of the collecting networks of the National Museum for Natural History and the National Herbarium, see A. Gijzen, *'s Rijks Museum van Natuurlijke Historie, 1820-1915* (Rotterdam: W.L. & J. Brusse's Uitgeversmaatschappij N.V., 1938), 86-194; and M.J. van Steenis-Kruseman, "The collections of the Rijksherbarium," *Blumea* 25 (1979): 13-26.

provided the collections of the National Museum and the National Herbarium with a rapidly growing number of items.

Figure 2: Watercolour drawing of a red-throated barbet. The drawing was made by Pieter van Oort in Buitenzorg, Java, May 1827.

Moreover, several sumptuous publications and articles on the flora and fauna of the Netherlands Indies came off the press. Many of these publications were initiated and edited by the directors of the National Museum and the National Herbarium. Descriptions and illustrations of collected mammals were published in the *Monographies de mammalogie* (1827-41). Birds were described in the *Nouveau recueil de planches coloriées d'oiseaux* (1820-39), and newly discovered plants in the *Flora Javae nec non insularum*

adjacentium (1826-56). A general overview of the field work was given in the three lavishly produced volumes of the Proceedings on the Natural History of the Dutch Overseas Possessions (*Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen*) which appeared in several instalments between 1839 and 1847.[8]

This brief overview of early nineteenth-century Dutch colonial surveying and collecting projects allows a first glimpse of the rich material, visual and textual outcomes of these endeavours. Many of the items are now scattered among museums and archives in Indonesia and the Netherlands. Taken together, the material provides a strong lens through which to view the intricate relationship between domestic and colonial governance and science in the early nineteenth century in the context of the Dutch empire. Owing to the unexpected abundance of archival material, this study focuses on the career of Caspar Georg Carl Reinwardt, the first in a long line of mentioned colonial travellers in and surveyors of the Netherlands Indies. This focus has two major advantages. On the one hand, it allows us to provide a firm historical basis for further analyses of other individuals and institutions involved. On the other hand, it shows that neither these travellers nor their material and textual bequests can be fully understood if they are not carefully embedded in their wider social, cultural, political, and economic context. Only then can individuals such as Reinwardt and his travelling successors function as a powerful heuristic tool to provide a combined history of science *and* empire, areas of inquiry that, up to now, have too often been treated as two distinct historical narratives.

Historiography

By focusing on the career of the traveller and administrator Reinwardt, this study differs from existing studies in the field of Dutch colonialism and science. While several historians have provided insightful and useful descriptions and summaries of various projects of scientific inquiry in the Netherlands Indies[9], others have based their narratives on issues such as the

[8] Gijzen, *'s Rijks Museum van Natuurlijke Historie*, 240-42; and C.G.G.J. van Steenis, "The Rijksherbarium and its contribution to the knowledge of the tropical Asiatic flora," *Blumea* 25 (1979): 59-62.

[9] P. Boomgaard, "The making and unmaking of tropical science. Dutch research on Indonesia, 1600-2000," *Bijdragen tot de Taal-, Land- en Volkenkunde* 162: 2/3 (2006): 191-217; K. van Berkel, *A history of science in the Netherlands. Survey, themes and reference*

diffusion of 'pure' sciences to colonial areas (Lewis Pyenson) or the failure of enlightened science in colonial and post-colonial Indonesia (Andrew Goss).[10] In particular Pyenson's attempt to separate 'colonialism' and 'science' in the nineteenth and early twentieth century into two independent narratives has received much scholarly criticism. According to the historians of science Paolo Palladino and Michael Worboys, Pyenson

> . . . wishes to draw attention to the value of the scientific mode of inquiry as one of the highest intellectual achievements of Enlightenment. By chronicling the great "civilizing mission" of the "exact" sciences, Pyenson seeks to challenge the contextualist and relativist programs of social historians and sociologists. He believes that if the dominant historical movement of the late nineteenth and early twentieth century, namely "savage and ubiquitous" imperialism, can be shown to have had no influence on the physical and astronomical sciences he studies, then those programs are worthless.[11]

Goss's analysis is more nuanced but shares the disadvantage that it also departs from a normative notion of how science should have developed in the Malay Archipelago. In his view the continuous intervention of the colonial and post-colonial state prevented the seeds of 'enlightened' science

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(Leiden: Brill, 1999), 210-28; H. Maat, *Science cultivating practice. A history of agricultural science in the Netherlands and its colonies 1863-1986* (Wageningen: Ponsen & Looijen, 2001); P. Honig and F. Verdoorn, eds., *Science and scientists in the Netherlands Indies* (New York: Board for the Netherlands Indies, Surinam and Curaçao, 1945); Sirks, *Indisch natuuronderzoek*; H.J. Veth. *Overzicht van hetgeen, in het bijzonder door Nederland, gedaan is voor de kennis der fauna van Nederlandsch Indië*. Leiden: Van Doesburgh, 1879. A noteworthy exception is the papers of the first and third conferences, on the transfer of science and technology between Europe and Asia since Vasco da Gama (1498-1998), in 1991 and 1994. The papers are published as the third and sixth volumes of the *Journal of the Japan-Netherlands Institute*.

[10] L. Pyenson, *Empire of reason. Exact sciences in Indonesia, 1840-1940* (Leiden: Brill, 1989). Similar and more recently, L. Pyenson, "The enlightened image of nature in the Dutch East Indies: Consequences of postmodernist doctrine for broad structures and intimate life," *Historical studies in the natural sciences* 41: 1 (2011): 1-40 and A. Goss, *The Floracrats. State-sponsored science and the failure of enlightenment in Indonesia* (Madison: University of Wisconsin Press, 2011).

[11] P. Palladino and M. Worboys, "Science and imperialism," *Isis* 83:1 (1993): 92.

from falling on fertile ground in colonial and post-colonial Indonesia. Seen from this perspective, it does not surprise that every scientific inquiry in the region must appear as, as Goss puts it, a "footnote in the history of science".[12]

Unlike the work of historians such as Pyenson and Goss, it is not the intention of this study to judge the scientific and administrative achievements of 'scientists' in colonial and post-colonial Indonesia. It wants rather to illustrate that 'science' can never be seen as a category disconnected from its social, political, and economic environment. In particular in the decades around 1800, 'science' was a co-evolutionary endeavour that both shaped and was shaped by the milieu in which it developed.[13] To substantiate this claim it is necessary to briefly shed light on recent discussions in history of science.

While the traditional historiography of science assumes that scientific and other forms of knowledge developed in early modern Europe and subsequently spread to the rest of the world through processes of diffusion,[14] historians who use the more globally oriented 'circulation of knowledge' approach sketch a more nuanced picture. Instead of viewing the movement of supposedly superior Western knowledges (such as trained humans, machines, instruments, notes, practices, or concepts, etc.) as a unidirectional flow from the West to the rest of the world, these studies highlight the historical contingency and the alteration of existing knowledges and practices which circulation entailed.[15]

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[12] Goss, *The floracrats*, 4. For a more detailed elaboration of this point see my review of Goss' study in the *Bijdragen tot de Taal-, Land- en Volkenkunde* 167:2/3 (2011): 340-342.

[13] This claim is further explored in, for instance, B. Latour, "Postmodern? No, simply amodern! Steps towards an anthropology of science," *Studies in history and philosophy of science* 21:1 (1990): 145-171. And for a case study on the shifting identity of 'botanists' at the end of the eighteenth century see: E.C. Spary, "Of nutmegs and botanists. The colonial cultivation of botanical identity," in *Colonial botany. Science, commerce, and politics in the early modern world*, ed. L. Schiebinger et al. (Philadelphia: University of Pennsylvania Press, 2005), 187-203.

[14] G. Basalla, "The spread of western science," *Science* 156:3775 (1967): 611-22.

[15] A good overview of discussions in the field can be found in S. Sivasundaram, "Sciences and the global: On methods, questions and theory," *Isis* 101:1 (2010): 146-158; L. Roberts, "Situating science in global history. Local exchanges and networks of circulation," *Itinerario* 23:1 (2009): 9-30; S.G. Solomon, "Circulation of knowledge and the Russian locale," *Kritika: Explorations in Russian and Eurasian history* 9:1 (2008): 9-26; F. Fan, "Science in cultural borderlands: methodological reflections on the study of science, European

The philosopher of science Bruno Latour has even developed a model to get an analytical grip on the reconfiguration of knowledge on the move. Latour suggests that metropolitan actors tried to use travelling naturalists as calibrated tools to bridge the epistemological and geographical gap between foreign sites, where field work was done, and scientific institutions at home.[16] Or, in the words of David Livingstone, a historical geographer who uses Latour's model in his programmatic study *Putting science in its place*: "Those *absent* from some space of knowledge production needed to find ways of assuring themselves that those *present* had gathered information in an appropriate manner."[17] In order to guarantee that sedentary naturalists in Amsterdam, Vienna, Berlin, Paris and London were able to interpret the knowledge accumulated in the field, several calibrating strategies had to be applied. These ranged from careful preparatory training to concrete and detailed instructions of how foreign sites should be explored, observed, mapped, described, measured and pictured. Among the primary carriers of this global exchange of knowledge were, for instance, the trade networks established by the British and Dutch East India Companies.[18]

Latour offers as a model the work of the French navy officer Jean-François de Galaup, comte de La Pérouse (1741-1788), in the Pacific Ocean in the late 1780s. The French king Louis XVI (1752-1793) had commissioned La Pérouse to map the entire ocean in order to gain a strategic and economic advantage over the British, who had imposed their rule over large parts of the Indian subcontinent.[19] In 1787, La Pérouse and his crew—

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imperialism, and cultural encounter," *East Asian science, technology and society* 1 (2007): 213-31; and J.A. Secord, "Knowledge in transit," *Isis* 95:4 (2004): 654-72.

[16] B. Latour, *Science in action: How to follow scientists and engineers through society* (Cambridge: Harvard University Press, 1987), 215-57.

[17] D. Livingstone, *Putting science in its place: geographies of scientific knowledge* (Chicago: University of Chicago Press, 2003), 147.

[18] The link between European trading companies and knowledge production is further explored in S. Huigen, J.L. de Jong, and E. Kolfin, eds., *The Dutch trading companies as knowledge networks* (Brill: Leiden, 2010); H.J. Cook, *Matters of exchange. Commerce, medicine, and science in the Dutch Golden Age* (New Haven: Yale University Press, 2007); L. Blussé and I. Ooms, eds., *Kennis en compagnie: de Verenigde Oost-Indische Compagnie en de moderne wetenschap* (Amsterdam: Balans, 2002); and S.J. Harris, "Long-distance corporations, big science and the geography of knowledge," *Configurations* 6:2 (1998): 269-304.

[19] For an overview of French and British expeditions to the Pacific Ocean in the 1780s, see P.J. Marshall and G. Williams, *The great map of mankind. British perceptions of the world in the age of enlightenment* (London: J.M. Dent & Sons, 1982), chapter 9.

which consisted of, among others, astronomers, botanists, artists and mineralogists—set foot on Sakhalin in the Northern Pacific. At first, the explorer did not know whether Sakhalin was an island or a peninsula connected with Asia. Even the maps and older travel books which they had on board of their ship, the *L'Astrolabe*, gave contradictory evidence. When they encountered a few inhabitants, the French learned that Sakhalin was indeed an island. One of the Chinese inhabitants even sketched a rough map of the area in La Pérouse's notebook.

The local geographical knowledge La Pérouse was able to gather at Sakhalin and other places in the Pacific subsequently reached the navy headquarter in Versailles in the form of notebooks, maps, sketches and tables with measurements. In Versailles—the "centre of calculation" in Latour's words—the local knowledge was subsequently transformed and appropriated into standardized, universally valid and stable forms of knowledge such as maps and globes. These "immutable mobiles", as Latour dubs them, eventually circulated from Versailles to London, Berlin, and Amsterdam and functioned as an inspiration for later expeditions to the Pacific region to accumulate additional knowledge of the region's geography, economy and societies which would in turn be analysed and reworked in Europe. Latour's circulatory model thus provides fertile ground for narratives transcending the notion that 'scientific' knowledge was an exclusive product of the Western world spreading gradually to non-European areas. The model rather insinuates that 'scientific' knowledge must be seen as the contingent product of myriad local encounters at various sites around the globe.

Although Latour stresses the importance of encounters at non-Western sites for the formation of 'scientific' knowledge, his model fails to get an analytical grip on the micro-histories of the localities that constituted the spatial, intellectual and material framework for such encounters. By providing in-depth analyses of figures and institutions *in between* in key regions such as Northern America, the Atlantic world, South America, the Caribbean, the Malay Archipelago, the Pacific region, India, or China, historians such as Fa-ti Fan, Londa Schiebinger, Kapil Raj, James Delbourgo, David Turnbull, Lissa Roberts, Jane Camerini, James H. Merrell, Richard White and others have shown that encounters at these sites were far from being simple endeavours. [20] Their case studies demonstrate that the

[20] See, for instance, M. Häberlein, and A. Keese, eds., *Sprachgrenzen – Sprachkontakte – kulturelle Vermittler. Kommunikation zwischen Europäern und Außereuropäern. (16.-20. Jahrhundert)* (Stuttgart: Franz Steiner Verlag, 2010); S. Schaffer, L. Roberts, K. Raj, and

accumulation of knowledge in those regions was often based on a series of multi-layered and highly contingent interactions in which local institutions, nature, skills, networks and agents played a crucial role. Seen from this perspective, the creation of knowledge *on the spot* is not the result of *one* decisive encounter, as Latour puts, but rather the outcome of complex interactions between human and non-human actors at certain places and times in the past.[21]

The same point can be made for the European side of Latour's model. In recent years various scholars have convincingly shown that the transformation of local knowledge into universally valid 'scientific' knowledge in Europe was a rather intricate and contingent endeavour in which competition and rhetoric played a crucial role. The huge influx of information that reached Europe in the form of maps, notes, illustrations, sketches, tables, specimens, ship journals, field diaries, and the like in the late

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J. Delbourgo, eds., *The brokered world. Go-betweens and the global intelligence, 1770-1820* (Sagamore Beach, MA: Science History Publications, 2009); J. Delbourgo and N. Dew, eds., *Science and empire in the Atlantic world* (New York: Routledge, 2008); K. Raj, *Relocating modern science. Circulation and the construction of knowledge in South Asia and Europe, 1650-1900* (Basingstoke: Palgrave Macmillan, 2007); S. Moon, *Technology and ethical idealism. A history of development in the Netherlands East Indies* (Leiden: CNWS, 2007); F. Fan, *British naturalists in Qing China: Science, empire, and cultural encounter* (Cambridge: Harvard University Press, 2004); L. Schiebinger, *Plants and empire. Colonial bioprospecting in the Atlantic World* (Cambridge: Harvard University Press, 2004); D. Turnbull, *Masons, tricksters and cartographers: comparative studies in the sociology of scientific and indigenous knowledge* (Amsterdam: Harwood Academic, 2000); J.H. Merrell, *Into the American woods. Negotiators on the Pennsylvania frontier* (New York: Norton, 1999); J. Camerini, "Wallace in the field," *Osiris* 11 (1996): 44-65; V. Houben, *Kraton and Kompeni. Surakarta and Yogyakarta, 1830-1870* (Leiden: KITLV Press, 1994); N. Thomas. *Entangled objects: Exchange, material culture, and colonialism in the Pacific* (Cambridge: Harvard University Press, 1991), and R. White. *The middle ground. Indian, empires, and republics in the Great Lakes region 1650-1815* (Cambridge: Cambridge University Press, 1991).

[21] On the 'situatedness' of science in general see Ch.W.J. Withers and D.N. Livingstone, "Thinking geographically about nineteenth century science," in *Geographies of nineteenth-century science*, ed. D.N. Livingstone et al. (Chicago: University of Chicago Press, 2011): 1-19; D.A. Finnegan, "The spatial turn: geographical approaches in the history of science," *Journal of the history of biology* 41:2 (2008): 369-88; D. Edgerton, *The shock of the old: technology and global history since 1900* (London: Profile Books, 2006); S. Shapin, "Placing the view from nowhere: historical and sociological problems in the location of science," *Transactions of the institute of British geographers* 23:1 (1998): 5-12 and A. Pickering, *The mangle of practice. Time, agency & science* (Chicago: University of Chicago Press, 1995), introduction.

eighteenth and early nineteenth centuries caused severe tensions among different groups of professionals (museum directors, travellers, administrators) about how the material had to be appropriated and used. A brief discussion of the work and career of the famous cameralist and traveller Alexander von Humboldt (1769-1859), sheds some light on the rising tensions among institutions and individuals within Europe's metropoles.

Von Humboldt and his French companion Aimé Jacques Alexandre Bonpland (1773-1858), a plant expert, reached the Spanish American colonies in 1799. At that time Von Humboldt was a well-known administrator and mining expert who had managed to transform the mines of the Prussian domains of Ansbach and Bayreuth into profitable endeavours. Due to a large bequest from his mother's side, Van Humboldt was eventually able to quit his work as mining inspector and shift his focus on his career as travelling naturalist.[22]

During their five years in South America, Von Humboldt and Bonpland made extensive journeys in the region and accumulated an incredible number of specimens, measurements and observations. Both *voyageurs* returned to Paris in 1804. While Bonpland received a position as gardener at Château de Malmaison, a property of Napoleon Bonaparte's wife, Joséphine de Beauharnais (1763-1814), Von Humboldt continued his career as travelling naturalist by transforming his field notes and observations into a multi-volume travel account written in French and in German.[23] The first volumes of his narrative came off the press in 1805, one year after his return. In order to meet the expectations of his European audience and to claim the status and authority of a scientific hero, Von Humboldt used his account as a vehicle for fashioning himself as an intrepid, manly and solitary voyageur who had mastered the perils of travelling through untamed and dangerous nature in South America.[24]

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[22] For Von Humboldt's early career as mining inspector, see this slightly dated but still valuable biography, H. Beck, *Alexander von Humboldt,* vol. 1, *Von der Bildungsreise zur Forschungsreise 1769-1804* (Wiesbaden: Franz Steiner Verlag, 1959), chapter 2. For a more recent analysis see: U. Klein, "The Prussian mining official Alexander von Humboldt," *Annals of Science* 69:1 (2012): 27-68.

[23] For detailed analyses of the processing of his botanical findings in Europe, see, for instance, H.W. Lack, *Alexander von Humboldt und die botanische Erforschung Amerikas* (München: Prestel, 2009).

[24] See, for instance, M.L. Pratt, *Imperial travel eyes. Travel writing and transculturation* (New York: Routledge, 2008), chapter 6; and D. Outram, "New spaces in natural history," in *Cultures of natural history,* ed. N. Jardine et al. (Cambridge: Cambridge

Although travelling through Spain's overseas empire was certainly a challenging endeavour, Von Humboldt remained mostly silent about how he went about acquiring the information he discusses in his published narrative. He does not mention the colonial infrastructure much less the skills and knowledge of a broad array of local helpers such as gardeners, porters, fishermen, civil servants, translators, hunters, and guides who helped him and Bonpland cope with the complexity of the South American landscape. One must also not forget that Von Humboldt was also allowed to use the results of earlier large-scale surveys of the region which the Spanish Bourbons had launched in the second half of the eighteenth century. Like the governments of Sweden, France, and Britain, the Spanish rulers had undertaken major efforts to investigate and 'improve' the exploitation of their overseas territories in the aftermath of the Seven Years' War (1756-1763).[25] Von Humboldt's proto-ecological approach to nature, which historians later labelled as 'romantic' or 'humboldtian science', was thus firmly rooted in a political climate where the improvement of agriculture, economy and society played a decisive role.[26]

University Press) 1996, 249-65. Pratt's and Outram's readings of Von Humboldt stand in stark contrast to the rather ahistorical work of the Berlin literary historian Ottmar Ette. Ette tends to praise Von Humboldt for his advanced research techniques and creative way of organizing and narrating different forms of knowledge. In one of his more recent studies, Ette, for instance, depicts Von Humboldt as a mentor whose research techniques and narratives should be considered as tools to get a better understanding of our globalized world; see O. Ette, *Alexander von Humboldt und die Globalisierung* (Frankfurt am Main: Insel, 2009) and also the platform http://www.avhumboldt.de/.

[25] D. Bleichmar, "Atlantic competitions. Botany in the eighteenth-century Spanish Empire," in *Science and Empire in the Atlantic world*, ed. J. Delbourgo et al. (New York: Routledge, 2008), 225-52.; J. Cañizares-Esguarra, "How derivate was Humboldt? Microcosmic nature narratives in Early Modern Spanish America and (other) origins of Humboldt's ecological sensibilities," in *Colonial botany. Science, commerce, and politics in the Early Modern world*, ed. L. Schiebinger et al. (Philadelphia: University of Pennsylvania Press, 2005), 148-65 and in particular 158-61; A. Lafuente, "Enlightenment in an imperial context: Local science in the late-eighteenth century Hispanic world," in *Nature and Empire. Science and the colonial enterprise*, ed. R. MacLeod (Chicago: University of Chicago Press, 2000), 155-73. For a general overview of projects of 'improvement' in Europe and overseas see: R. Drayton, *Nature's government. Science, Imperial Britain and the 'Improvement' of the world* (New Haven: Yale University Press, 2000), chapters 3 and 4.

[26] The label 'Humboldtian science' was introduced by S.F. Cannon, *Science in culture: The early modern period.* (New York: Science History Publications, 1978), chapter 4. For a critical evaluation of that label, see M. Dettelbach, "Humboldtian science," in *Cultures*

Von Humboldt eventually used his new social status as heroic travelling naturalist to promote an analysis and view of nature that substantially diverged from notions his fellow naturalists at the Muséum national d'histoire naturelle in Paris had developed. In particular his claim that only the measurement, observation and the sensual perception of nature in "the field" would unravel the laws of nature contradicted the work of his influential sedentary colleague Georges Cuvier (1769-1832) who held a professorship in natural history at the Muséum. According to Cuvier, the proper investigations of nature had to be carried out at the Muséum where field specimens were prepared, examined and carefully compared, for only the careful comparison of specimens would be able to unravel the secrets and wealth of nature. For Cuvier, Von Humboldt's fieldwork was nothing more than a superficial, fragmentary and insecure endeavour. Cuvier also heavily criticized Von Humboldt's attempts to fashion himself as intrepid traveller. In the end, travellers such as Von Humboldt thus remained unpredictable tools. Instead of fully facilitating metropolitan interests, they rather used their new authority to question and destabilize established ways of investigating nature.[27]

The brief discussion of case studies of the production of knowledge *on the spot* and the difficulties, tensions and intellectual labour to transform and appropriate such local knowledge in Europe, clearly shows the limits of Latour's model. The main disadvantage of Latour's model is its inability to get an analytical grip on the micro-histories of knowledge production at localities in Europe and elsewhere. In particular Latour's notion that both the transfer of geographical knowledge at the beach of Sakhalin as well as the transformation of field notes into universally valid cartographical knowledge was the result of *one* decisive moment remains too fuzzy to serve as a heuristic tool. Whether in Europe or 'in the field', the meaning and concrete shape of knowledge were constantly under negotiation.

The major advantage of Latour's model, however, is that it helps to overcome simple dichotomies on which scholars such as Peyenson and to a

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of natural history, ed. N. Jardine, et al. (Cambridge: Cambridge University Press, 1996), 287-304, M. Dettelbach, "Alexander von Humboldt. Between enlightenment and romanticism," *Northeastern Naturalist* 1 (2001): 9-20 and Klein, "The Prussian mining official Alexander von Humboldt". For an attempt to root Von Humboldt's plant geography in German Romanticism, see M. Nicholson, "Alexander von Humboldt, Humboldtian science, and the origins of the study of vegetation," *History of Science* 25 (1987), 167-94.

[27] Outram, "New spaces in natural history," 249-65.

lesser extent Goss have based their historical narratives in a Dutch colonial context. Reflecting upon Latour's model thus prevents historians from considering colonialism/imperialism and the emergence of modern science as two separate stories. It also offers fertile ground for analyses that study the emergence of 'scientific' knowledge as the contingent outcome of a series of local encounters at sites connected by the circulation of objects, specimens, people, notes, illustrations, drawings, tables, and so on. Instead of assuming that 'scientific' knowledge was exclusively produced by Westerners and their institutions and then spread to the rest of the world by diffusion, such a notion rather integrates non-Western sites and agents as crucial but hidden pillars of modern science. Latour's model thus paves the way for a more balanced narrative weaving the various micro-histories of knowledge production together into a panoramic tableau revealing the interconnectedness and co-evolutionary character of science, governance, and empire in the decennia around 1800.

Structure and Content

Figures such as Reinwardt who made their career at the crossroads of the mentioned fields are perfect tools for making this complex relationship visible. The in-depth analyses of Reinwardt's career in Amsterdam, Harderwijk, Haarlem, the Malay Archipelago and Leiden shows that retrospectively defined categories such as 'naturalist', 'botanist', 'chemist', 'zoologist', 'geologist', 'mineralogist', 'administrator', and 'collector' are too rigid to convey the sense of political, economic and intellectual developments in the Netherlands and its colonial possessions in the Malay Archipelago in the late eighteenth and early nineteenth centuries. Reinwardt was a rather hybrid figure who, owing to political unrest, was continuously forced to look for new ways to pursue his career. In particular, his practical training as chemist and apothecary assistant in Amsterdam helped him cope with difficult political and economic circumstances.

By following Reinwardt to Amsterdam the first chapter of this study seeks to reconstruct the social, political and professional milieu in which Reinwardt trained and socialized. The chapter will show that it was manufacturers of chemicals and apothecaries in Amsterdam, especially, who sparked the introduction of innovative chemical practices in order to compensate for the dwindling delivery of raw material from the colonies in the East and West Indies in the aftermath of the Fourth Anglo-Dutch War

(1780-84). Many of them considered chemistry part of a larger 'oeconomic' discipline. One of their primary achievements was securing the widespread application of exact measuring devices such as aerometers, barometers, thermometers, and balances in different useful contexts. These devices allowed them to standardize and improve the production of various medical drugs and chemicals in their small laboratories. During his years as apprentice in Amsterdam, Reinwardt thus gained a deeper understanding of how measurement, standardization, and analytic reasoning could function as core tools for enhancing the efficiency of small enterprises in particular and society in general.

The second chapter situates Reinwardt in the small town of Harderwijk in the province Gelderland in the years after the Batavian Revolution in 1795. Although Reinwardt held neither a pharmaceutical nor an academic diploma, the Batavian administrators appointed the former chemist-apothecary as university professor for chemistry, natural history and herbology. His appointment shows that his practical chemical training also qualified him for his duties as an academic teacher. While at Harderwijk, Reinwardt got involved in various 'provincial committees' being set up by the Batavian administrators to improve the province's agriculture and medical education. These committees and his position at the university served Reinwardt as important platform to fashion himself as a 'useful' university professor *and* able administrator who know how improve the economic exploitation of the province of Gelderland.

As the third chapter shows, Reinwardt continued his career as useful academic *and* administrator first in Haarlem and later Amsterdam under the regime of Louis Napoleon. During his years as director of a new royal garden and cabinet in Haarlem, Reinwardt intensified his contacts with the Dutch Society of Sciences (Hollandsche Maatschappij van Wetenschappen) and Teyler's Second Society (Teyler's Tweede Genootschap). Both societies formed important nodal points in the country's scientific geography. In particular, through his friendship with the physician Martinus van Marum (1750-1837), since 1794 secretary of the Dutch Society, Reinwardt gained access to an influential network of wealthy amateurs and learned men. During his years in Amsterdam, where he received a professorship for chemistry, natural history and herbology in 1810, Reinwardt used his new social status to refashion and present himself as a travelling, measuring and observing naturalist. In contradiction to other experts naturalists who focused almost exclusively on collecting, describing and naming plants, animals and minerals, Reinwardt now stressed the importance of field

observations and measurable environmental factors such as temperature, soil quality, altitude and humidity, all of which influenced the growth and productivity of plants. For only by travelling and measuring these environmental features would allow one to unravel the underlying forces of nature which shaped and continued to shape the vegetation of a certain area. The chapter thus shows that Reinwardt's proto-ecological vision of nature, which historians have labelled 'humboldtian' and 'encyclopaedic', was firmly rooted in a political climate in which the improvement of agriculture, economy and society played a decisive role.[28]

The fourth and fifth chapters follow Reinwardt to Java in the Malay Archipelago, where he stayed from 1816 to 1822 as advisor to a General Committee (*commissie generaal*). The Committee had been tasked with taking over the Netherlands Indies from the British and setting up a functioning colonial administration. As a high colonial civil servant, he was entitled to travel through large parts of the Malay Archipelago. As he did in the Netherlands, Reinwardt had a hybrid identity in the Dutch colony: on the one hand, he was involved in the establishment of a colonial state and on the other hand he was obliged to carry out a variety of natural historical investigations. As an advisor to the colonial government, he became involved in the improvement of the educational system, medical supervision, agriculture, and economic botany. Both chapters show that Reinwardt depended upon the colonial infrastructure as well as on the skills and knowledge of a broad array of local helpers.

The last chapter focuses on Reinwardt's early years as professor of natural history, botany, and chemistry in Leiden. Like travellers such as Von Humboldt, Reinwardt insisted on the primacy of his encounter with nature and people in the Malay Archipelago and presented himself as an heroic figure who had faced and mastered the perils of travelling through untamed and dangerous places. At the same time, his retrospective reconstructions of these encounters tended to de-emphasize or even erase the various local interactions and mediations on which the accumulation of knowledge in the field depended. At the same time, Reinwardt tried to use his alleged authority and status as travelling and intrepid naturalist *and* able administrator to challenge his sedentary colleagues in Leiden by announcing a 'new' natural history that should draw exclusively upon field research and

[28] For the application of the labels 'humboldtian' and 'encyclopedic' to Reinwardt, see, for instance, W. Otterspeer, *Groepsportret met de dame,* vol. 3, *De werken van de wetenschap. De Leidse Universiteit, 1776-1876* (Amsterdam: Bert Bakker, 2005), 274-75.

measurement. With his travel account on the Malay Archipelago Reinwardt aimed at contributing to a proto-ecological 'physical description' of the earth (*physikalische aardbeschrijving*) as cameralists, administrators, and travellers such as Johan Georg Adam Forster (1754-1794), José Celestino Mutis (1732-1808), and Von Humboldt had put forward in their writings. In the end, however, Reinwardt's travel account was never published. Owing to the rising costs of administering the colonies in the East, the king and his ministers eventually lost confidence in Reinwardt, who continuously praised the benefits of his investigations for colonial agriculture and trade. Instead of sponsoring the publication of Reinwardt's travel account, the king decided to erect a new National Museum of Natural History and a National Herbarium. The directors of both institutions – Reinwardt was passed over for these posts – received funding to enrich their collections and to initiate illustrated publications on the 'natural history' of the Dutch overseas possessions.

Taken together the six chapters shed light on the overlap between the realms of science, governance and empire in the Netherlands and its colonial possession in the decades around 1800. Seen through the lens of Reinwardt's career, this study shows that 'chemistry' functioned as an important link between these various domains. Owing to their practical education in the fields of chemistry, botany and efficient management of small companies, chemist-apothecaries such as Reinwardt could easily switch between the realms of agriculture, the processing industries, museums, botanical gardens, and state administration. In particular their claim that they were able to measure and harness the 'forces of nature', such as wind, water, fire and air for various useful ends made a deep impression on governments and rulers that ruled the Netherlands in the late eighteenth and early nineteenth centuries.