PETER BOOMGAARD

The making and unmaking of tropical science
Dutch research on Indonesia, 1600-2000

Introduction

The history of scientific research undertaken by Europeans in regions where they were the colonizing powers has been a popular and well researched topic for two decades now.[1] A growing number of studies, with some preponderance of botany and medicine, have appeared on colonial and proto-colonial science in the Americas and in Asia, and it seems likely that this is more than just a fad.[2] However, scientific research by Europeans on and in the Indonesian archipelago does not figure prominently in this literature. Very few scholars working on Indonesia – with Lewis Pyenson (1989, 1998) as the main exception – have specialized in this potentially rewarding field. In order to give an impression of topics that could profitably be addressed, this article presents an overview, in very broad outline, of European – and particularly Dutch – scientific research on Indonesia during the last four centuries, with emphasis on the periods of the Verenigde Oost-Indische Compagnie (VOC, Dutch East India Company) and the Dutch colonial state.

As an overview cannot do justice to all scientific disciplines, it has been necessary to make a selection, a selection based on the presence of features that I regard as especially characteristic of Dutch research on Indonesia. In many instances these features may not be exclusively Dutch or exclusively

1 This article started life as a keynote speech at the Open Science Conference in Jakarta in 2003. I am grateful for comments made by the anonymous reviewers. The term science as used here applies to the exact sciences only, following English rather than Dutch usage.

2 Arnold 1988, 1993, 1996; McLeod and Lewis 1988; Adas 1989; Low 1989; Kumar 1991; Cohn 1996; Miller and Reill 1996; Harrison 1999; Drayton 2000; McLeod 2000; Schiebinger and Swan 2005.

PETER BOOMGAARD is senior researcher at the KITLV and Professor of Economic and Environmental History of Southeast Asia, University of Amsterdam. He holds a PhD from the Vrije Universiteit, Amsterdam. Specializing in economic, environmental and social history, he has published *Children of the colonial state; Population growth and economie development in Java, 1795-1880,* Amsterdam: CASA, 1989 and *Frontiers of fear; Tigers and people in the Malay world, 1600-1950,* New Haven, CT: Yale University Press, 2001. Professor Boomgaard may be contacted at boomgaard@kitlv.nl.

Bijdragen tot de Taal-, Land- en Volkenkunde (BKI) 162-2/3 (2006):191-217

applicable to research on Indonesia; in some cases I would argue that they can be taken as representing European research in general or research on Asia in general. In my article, I link developments in scientific research on Indonesia to broader political, economic, and scholarly developments both in Europe and in Asia, particularly in Indonesia.

Is it only in times of crisis that Dutch scholars feel the need to account for their professional activities in the study of Indonesia? I know of five serious volumes on the history of Dutch research in and on Indonesia published between 1900 and 1950. The first one, written by M.J. Sirks, was published in 1915, which was the second year of the First World War. The second volume, edited by L.M.R. Rutten and published by the Koninklijke Akademie van Wetenschappen (Royal Academy of Arts and Sciences), is dated 1929, the first year of the world-wide depression of the 1930s. The other three volumes were all published between 1945 and 1950, just after the Second World War and during the Indonesian Revolution. The last three books are: one edited by Pieter Honig and Frans Verdoorn, the heftiest volume of the five mentioned here, dated 1945; a study edited by B.J.O. Schrieke and published in 1948; and the final volume, dated 1950, published by the Koninklijke Natuurkundige Vereeniging (Royal Association for Natural Science). If we look somewhat more closely, it is likely that the 1915 and 1929 volumes were conceived prior to the crisis years, and may thus reflect, on the contrary, years of prosperity and optimism.

After 1950, a long period of silence on this topic ended in 1989, when the Canadian historian of science Lewis Pyenson published his *Empire of reason; Exact sciences in Indonesia 1840-1940*, while in 2002 a volume edited by Leonard Blussé and Ilonka Ooms was published on modern science and the VOC. Midway between these publication dates, in 1995, Peter Klein gave a lecture on the Koninklijke Nederlandse Akademie van Wetenschappen (Royal Netherlands Academy of Arts and Sciences) and the Netherlands Indies.[3]

It would appear, therefore, that reflection on the role of Dutch scientific scholarship in and on Indonesia comes in waves, cycles, or clusters, and that we are now riding the crest of the most recent wave.

Seventeenth century

Is it possible that Dutch scientific activities on the Indonesian archipelago came in waves too? That inventions appear in clusters seems to be widely accepted in the literature on the history of science, and from there the step to identifying clusters of scientific research activities is not a large one. One can certainly envisage periods of economic prosperity, expansion, or nation building that might be instrumental in creating a critical mass of prerequi-

3 Sirks 1915; Rutten 1929; Honig and Verdoorn 1945; Schrieke 1948; *Een eeuw* 1950; Pyenson 1989; Klein 1995; Blussé and Ooms 2002.

sites – in terms of money, general enthusiasm, and scientific fervour – unusually favourable for scientific endeavour.

The first such wave to be discerned is that of the botanical discoveries in the seventeenth century, particularly the second half. The name of the seventeenth-century naturalist that is most closely linked to the territory of what is now Indonesia is that of the famous German naturalist in Dutch service, Georg Everhard Rumpf, better known as Rumphius, the Latinized version of his name. He was involved for many decades in investigations of the plants and animals of the Indonesian archipelago.[4] What made his work so valuable for the VOC was that he also described the various uses to which these organisms could be put by human beings, including medical uses. Rumphius, who had started his VOC career as a soldier, and who was transferred later on to the civil service of the VOC, was probably the first scholar to be paid by the VOC specifically for his scholarly activities, although formally he retained his bureaucratic rank and position, and for a long time carried out his research as a sideline. Apparently some high-ranking officials of the VOC were interested in Rumphius's scientific work, and were willing to keep him on the payroll in order to enable him to do research. When disaster struck and Rumphius became blind in 1670, they even paid for an assistant and a draughtsman, though this happened ten years later. However, the directors of the VOC in the Netherlands, the Gentlemen XVII, although evidently impressed by Rumphius's work, declined to have it published, saying they considered it unsuitable in various respects. We are left to speculate in what respects, but most likely they either wanted to keep his data secret, or else did not want to spend any more money on the project. Be that as it may, a few years later they changed their minds, but then could not find a publisher for the rather voluminous manuscript. The first volume of Rumphius's *Herbarium Amboinense* was not published until 1741, almost 40 years after his death.

Rumphius was in many ways a 'modern' scientist. His writings were based on a long period of field observations, and on the use of local, indigenous informants, whose friendship he cultivated. His first partner, Susanna, of whom we know next to nothing, may have been one of these informants. Rumphius acknowledged the help of his informants, mentioning them by name, something that was rare at the time. It seems reasonable to assume that the way he classified his plants and animals was heavily influenced by the classificatory notions of the local, indigenous populations, particularly those of Ambon, where Rumphius was stationed. He also corresponded with biologists in other VOC territories, thus creating his own network.

The reader with a scholarly background will find various features of this story familiar. It is difficult to get a large project funded. Although in the end

[4] In fact, his work was not confined to the borders of the present state of Indonesia, but included biota from the Philippines.

you may get part of what you want, funding is rarely sufficient or available when needed. You need to network, fieldwork is bad for your health, and it takes ages before results can be published.

Although Rumphius was not the first VOC employee to do botanical research in the Indies, he is arguably the best known. To my knowledge the first naturalist was Jacob de Bondt – in Latinized form, Jacobus Bontius – a Dutch medical doctor who was employed by the VOC as physician, apothecary, and overseer of surgeons. He resided in Batavia, present-day Jakarta, between 1627 and 1631, surviving the two sieges of Batavia by Sultan Agung's armies in 1628 and 1629, but dying soon thereafter in 1631, not yet 40 years old. In his case he was not being paid for his scholarly work, which he did as a sideline.

Three other seventeenth-century naturalists in VOC service worked in Malabar (southern India), Sri Lanka, and Japan respectively – Hendrik Adriaan van Reede tot Drakestein, Lord of Mydrecht, a high-ranking VOC official, and the physicians Engelbrecht Kaempfer and Paulus Hermann. Kaempfer went back to Europe and obtained his medical doctorate in Leiden. Hermann landed a professorship at the same university after having completed ten years of tropical research.[5]

So tropical researchers could be in luck after all, ending up as doctors or professors in Leiden. However, the important point is not that these scholars had a successful career, but that they went back to the Netherlands, in contrast to Rumphius, who never returned. Generally speaking, most European scholars doing research in and on the Indonesian archipelago during the last four centuries went back to Europe, where they continued their careers and had their work published.

Botanical research in Asia undertaken under the auspices of the VOC is also a good example of the kind of Dutch-Asian collaboration that prevailed until close to the end of the colonial period. The European botanist depended upon the good services of indigenous informants for the acquisition of plants, for indigenous nomenclature, and for knowledge of properties of the plant that made it useful to human beings. We know that the amateur botanist Van Reede had formed a kind of college of learned Brahmin naturalists in Malabar who discussed the properties of plants among themselves and then presented their final verdict to Van Reede, who published it in his *Hortus Malabaricus*. It has been suggested that indigenous classifications of plants came in this way to be known in Europe, where they were adopted in the botanical gardens of Leiden and Amsterdam by the most famous botanist of all times, Linnaeus, who incorporated these classifications in his system that is the basis of modern binomial nomenclature. Sometimes we come across the name of one of these indigenous informants, but usually they will remain forever anonymous.

[5] Rumphius 1741-50; Sirks 1915:4-61; Bontius 1931; Beekman 1996: 80-117, 2003:xv-xlviii; Baas 2002; Cook 2005; Buijze 2006.

Van Reede was in more than one sense exceptional. He stated that his motivation for pursuing his studies was not so much the useful properties of the plants he collected, as it was the beauty of the Malabar forests. This was certainly not the reason the VOC allowed and sometimes financed such research. The VOC made it abundantly clear, for instance in 1679, that the many plants with medicinal properties collected by Paulus Hermann in Sri Lanka were going to be used to supply Batavia with medicinal herbs, a move designed to render the expensive import of medicines from the Netherlands largely unnecessary. Their conviction was, however, that the notions of indigenous informants should not be accepted uncritically. When it was discovered that the botanist Ericus Schepperius, working in and around Batavia about 1730, was just copying down what his informants told him without putting the information to the test, he was sent packing.

This critical interest in tropical botany, in addition to being a down-to-earth, pragmatic, and economically motivated undertaking, was part of the so-called scientific revolution that was taking place around that time in Europe. In scholars such as Hermann and Rumphius, with their extensive contacts in England and Germany, we see the beginnings of an international community of scholars interested in modern science and technology. Tropical areas had become a topic and locus of serious scientific research for Europeans. Data from tropical areas were eagerly discussed and publicized by European learned societies of the period, such as the Royal Society in London and the Academia Naturae Curiosorum in Germany, and at various universities, although the role of the latter may have been less innovative than that of the learned societies. The Royal Society, founded in 1660 and given a royal charter of recognition in 1662, has been mentioned as the first example of the recognition of science by a modern nation state, even if it was founded as a private society. It could be argued that tropical science in the Indonesian archipelago in this early period was science that was variously tolerated, partly financed, or even organized by the state (represented at this time by the VOC).[6]

Late eighteenth century

The second wave of Dutch research on the Indonesian archipelago came in the late eighteenth century, a period that is now regarded by many scholars as the time of the second scientific revolution. It seems appropriate to see the founding of the Bataviaasch Genootschap van Kunsten en Wetenschappen (Batavian Society of Arts and Sciences) in the Indonesian archipelago itself, in 1778, as an act symbolizing this wave. It came in the wake of the founding of

[6] Sirks 1915:4-61; *Generale missiven* 1960-97, IV:295, IX:285-6; Brockway 1979:63; Cohen 1991:9-14; Boomgaard 1996:48-51; Grove 1998:199, 203. On the history of botanical nomenclature in general, see Pavord 2005.

similar societies in the Netherlands and elsewhere (Manchester, Philadelphia, Rio de Janeiro), which is usually viewed by historians as a typical feature of the Enlightenment. Another learned society founded in this period, in 1788, was the Linnaean Society in London, a meeting place for amateur naturalists. The Linnaean Society started a museum and a library at a time when neither the state nor universities did this.

The founders of the Batavian Society were not primarily scholars, but interested and well-connected bourgeois amateurs, such as lawyers, Protestant ministers, and bureaucrats in the employ of the VOC. They were perhaps partly inspired by the conviction that if the Protestant religion was to be spread successfully in the East, this could only be done by first giving the local population a taste of Western arts and sciences. But I have to admit that this sentiment, which is an almost verbatim quotation by J.C.M. Radermacher, one of the founders of the Batavian Society, sounds a bit too glib, as if he was giving a socially required and politically correct statement. It is my impression that the founders of the Batavian Society were a bunch of rather well-to-do amateurs who dabbled in arts and sciences in their spare time, a typical example of what are sometimes called gentlemen scholars.

Be that as it may, the Batavian Society started the publication of a series of *Verhandelingen* – *Transactions* would be the English equivalent – which would continue far into the twentieth century. Originally, the volumes of this series would often contain, cheek by jowl in one issue, detailed reports on the state of ancient temple ruins in Java, travelogues of botanical trips on the slopes of Java's volcanoes, and a blow-by-blow account of how long it took a certain species of small animal to die from the poison of the infamous *upas ancar* or poison tree, along with the chemical analysis of this poison. The reader may be familiar with the idea of 'two cultures' postulated by the British scientist and novelist C.P. Snow – the culture of the humanities and the culture of the exact sciences – cultures that, to Snow's regret, had become mutually incomprehensible. In the *Verhandelingen* of the Batavian Society these two cultures were still united, at least until the middle of the nineteenth century. Later on, the Batavian Society would also start a museum and a library. The museum is still there, and the library is now part of the National Library of Indonesia in Jakarta.

From its very start the Batavian Society was supported by the VOC, although originally the only financial support was that the Society was allowed to have its publications printed on the Company's presses, provided they pay for the paper. But in the nineteenth century the colonial government subsidized the Society with fairly large annual sums. Although soon after its early years the Society went through a period of inactivity, the fact that such a society could be founded at all, and the fact that it was supported by the state, make this event a phenomenon worthy of note. Here, for the first time since the Dutch

had arrived in the Indonesian archipelago, we witness an initiative designed to boost local scholarly enterprise separately from the institutions already present in the mother country. I am inclined to see this as the first intimation of feelings of a separate identity of Dutch people who had stayed in the Indonesian archipelago for an extended period of time. We should not forget that the group of people of Dutch extraction born in the Indies was slowly but surely increasing, a group that in Latin America would have been called *criollos* or Creoles, and for whose Indonesian counterparts, to my knowledge, we don't have an appropriate term. In Latin America the contrast and potential tension between scholars born in Spain or Portugal, and Creole Spaniards and Portuguese born in Latin America is a typical *topos* in the history of science, and I am suggesting here that it might be one in the Indonesian context as well.

Here I would like to mention another wealthy amateur scientist from roughly the same period, a Protestant clergyman by training, born in Germany, who had made his home in the colony. This was Johan Mauritz Mohr, who, after a long and distinguished ecclesiastical and educational career in the service of the VOC, developed an interest in astronomy. Being a man of means, probably acquired through marriage and certainly not from his job as a man of the cloth, he ordered the latest in equipment and books from the Netherlands. In 1769 his observatory was ready, just in time to observe the transit of Venus across the sun. This was an event that elicited much interest in France and England, and scholars from these countries came to visit Mohr's observatory. One of the expeditions sent out to observe the transit of Venus was that of Captain James Cook, famous for his journeys of discovery in the Pacific. Aboard his ship was Sir Joseph Banks, an avid amateur botanist and an important patron of the sciences, who later would become the president of the Royal Society in London. If one wanted an appropriate symbol of the late eighteenth-century link between science and empire in Britain, Banks would be an excellent candidate.

If astronomy in those days was primarily a hobby of amateur scientists, it was also a means to an end. It was used to calculate the true longitude of places, and was therefore a handmaiden of geography and navigation. Mohr calculated the true longitude of Batavia, and the differences in longitude between Greenwich, Paris, and Batavia. These and other astronomical calculations were published, through the good services of James Cook, in the *Philosophical Transactions* of the Royal Society in London. Mohr had put Batavia on the map.

Finally I should mention Mohr's interest in volcanoes; he published an article on the eruption of Mount Papandayan in 1772 in the *Verhandelingen* of the Holland Society of Arts and Sciences in Haarlem, the organization that had been the model for the Batavian Society.[7]

[7] Sirks 1915:62-85; Brockway 1979:64-6; Pyenson 1989:7, 19; Dean 1995:117-20; Miller 1996:3-5; Lafuente 2000.

Thus this episode comes full circle. European scholars, often amateurs, working and residing in the Indonesian archipelago, more often than not in the employ of the state, were part of a web of learned societies that had sprung up in Europe and the Americas. They published in the journals of these societies, and not only in the ones of their own country of origin. They participated in early international research projects such as the observation of the transit of Venus. From 1778 onwards they had their own society and their own journal, covering both humanities and sciences. Research in the colony was no longer entirely in the hands of the mother country. The state supported these developments, though it did not take the initiative.

Circa 1820

There was another flurry of activities right after the British interregnum, when Thomas Stamford Raffles held sway over Java, between 1811 and 1815. Raffles, who was also an amateur scholar, a patron of science, and a member of the Batavian Society, had been instrumental in reviving the Batavian Society by creating an atmosphere of support for scholarly endeavour. After Napoleon's defeat in 1815, the colony was returned to the Dutch, who now started the construction of the edifice of a real colonial state, instead of the half-baked one that the VOC had been. Three commissioners-general were sent from the Netherlands to get the job done. In the same year, 1815, it was decided in the Netherlands to send what amounted to a fourth commissioner. This was Caspar Georg Carl Reinwardt, another German, who was put in charge of education, the medical service, agriculture, industry, and scientific research.

Reinwardt, at an early age a professor of what later would be the University of Amsterdam, and a member of what later would be the Royal Netherlands Academy of Arts and Sciences, will not be remembered for his publications, but for his organizational work. He was the founder, in 1817, of the famous Botanical Gardens in Buitenzorg, now the Kebun Raya in Bogor. He reinforced the campaign, designed by Raffles, for the vaccination against smallpox, and he drafted regulations for European-style primary education in Java, which led to the establishment of the first government primary school in Weltevreden, Batavia, in 1817.

From this short list it will be apparent how important Reinwardt's activities were for the Indonesian archipelago and for European scholarly research in and around the region. As regards the Botanical Gardens, it can be said that it was the focal point not only for much research in biology, physics and chemistry, but also for research in agriculture, which was, of course, for a long time the most important sector in the colonial economy.

Reinwardt collected specimens from nature as well as man-made 'curiosities' for both the Museum van Natuurlijke Historie (Museum of Natural

History) and the Museum voor Volkenkunde (Ethnographic Museum) in Leiden. In 1822 he returned to the Netherlands, and obtained a professorship at Leiden University.

Another important development started in 1820, when the Dutch government announced the establishment of the Natural Science Commission for the Netherlands Indies, based on a recommendation by Temminck and Van Swinderen, professors in Leiden and Groningen respectively. Two young scholars, H. Kuhl and J.C. van Hasselt, were appointed as members of this commission and were sent to the Indonesian archipelago. Their task was to broaden scientific knowledge of the natural resources of the Indies. The government, for once, did not stint on expenses for this mission. Two technical assistants from the Netherlands were to accompany Kuhl and Van Hasselt and they were given a considerable sum of money for instruments and the like. There was money for a research trip lasting four to six years, while some sort of stipend would be available for three years after their return to enable them to get their findings published. There was even money to send Kuhl and Van Hasselt first to London and Paris in order to study the collections of the British Museum, the Linnaean Society, Kew Gardens, and the Musée d'Histoire Naturelle. In Paris they met many of the important natural scientists of the day, including Cuvier, Lamarck, and Von Humboldt. In 1820, the year of their departure to the East, Kuhl had already produced various publications, mainly in Germany (like so many of the scholars I have mentioned, he was German). Among these publications was a monograph on parrots as volume nine of the *Nova Acta Academiae Ceasaris Leopoldis*, a series of publications of a learned German society of which Rumphius had been a member. Around 1820, Reinwardt, Blume, Temminck, and Van Swinderen, all of them scholars with Indonesian research interests, were among the members of this society.

Alas, Kuhl and Van Hasselt, these two able and very active young scholars, were to die during their field trip before they could carry out much research. The two good friends were buried together in one grave at the Botanical Gardens of Buitenzorg. It is tempting to see these two young scholars as typical representatives of the age of romanticism, including their early death and what Germans call *Männerfreundschaft*. Love of nature in its wild state was a typical feature of romanticism, and where could wild nature better be studied than in the tropics?

One of their assistants, G. van Raalte, sent the specimens that had been collected to the Leiden Museum of Natural History, where its director, Temminck, took care of them, and sent them on to specialists who studied them and published Kuhl and Van Hasselt's findings. One of these was C.L. Blume, a botanist who published the systematic data based on Kuhl and Van Hasselt's botanical collections.

After the death of Kuhl and Van Hasselt, other scholars were appointed

to the commission, which published its magnum opus in three hefty volumes that appeared between 1839 and 1847, with Temminck as editor in chief. One volume was dedicated to botany, one to zoology, and one to geography and ethnology, a rather meagre result for so much work, energy, and money.[8]

Circa 1850

Another cycle of research activities started around 1850. It is represented by three scholars who, each in his own way, contributed to the development of scholarship in and about Indonesia: Franz Wilhelm Junghuhn, Willem Bosch, and Pieter Bleeker.

In contrast to the people mentioned in the last section, Junghuhn stayed in the Indonesian archipelago. Apart from a short stint in the Batak area (Sumatra), he lived most of his adult life in Java, mainly in the Priangan. Junghuhn, another German and another incurable romantic, was not a scholar who never left his library. He studied medicine, but, like many medical doctors before him, was more interested in botany. During his years as a student he made many botanical fieldtrips in Germany, attempted suicide, fought a duel in which he got wounded when he served in the Prussian army as a physician, and was put in prison because of the duel, where he had to serve a ten-year term. However, after two years he escaped to Africa, where he served half a year in the French foreign legion in Algeria. After all these adventures he came to the Netherlands, where he entered the colonial army as a physician, arriving in Batavia in 1835. However, it soon transpired that he was not cut out for life in the military, and the chief military physicians as well as the governors-general under whom he served let him go on with what he did best, namely the study of flora, fauna, and geology of Java. On this topic he published his magnum opus shortly after 1850. His main interest was in plant geography, and his three-volume book contained a comprehensive description of Java's plant communities. Such a book could only have been written by someone who had spent years and years trekking around Java and climbing its volcanoes. Junghuhn had a running feud with the botanist Blume, mentioned above, whom he accused of having stolen Kuhl and Van Hasselt's work, and for whose own observations during his relatively short stay in Java he had nothing but contempt. Carl Ludwig Blume had started his career in Java as Reinwardt's assistant, was appointed director of the Botanical Gardens in Buitenzorg in 1822, and returned to the Netherlands in 1826, where he became director of the National Herbarium and professor at Leiden University. He was a prolific writer, publishing several articles in the *Verhandelingen* of the Batavian Society, in addition to his main botanical studies that covered more

8 Temminck 1839-47; Sirks 1915:86-140; Fasseur 1994:22-3; Klein 1995:8-9.

than a thousand pages. Is this an example of a conflict between a Creole European who remained in the colony and one who after a short stint went back to Holland to make his career in the mother country?

Be that as it may, in the long run the fame of Junghuhn, whose evocative descriptions of Java's landscapes are still a good read, has by far outshone that of Blume.

The second scholar I mentioned as a representative of this wave of research is Willem Bosch.[9] He was a medical doctor who became chief of the medical service of the army in the Netherlands Indies. Besides being a practising physician and an able administrator, Bosch was a keen medical researcher. During the late 1840s he clashed rather vehemently with the colonial government in Batavia, because in his opinion poverty was one of the important causes of the epidemic that raged in Central Java from 1847 onwards, and he did not hesitate to mention this in his reports to the governor-general. His lasting fame, however, he owes to his role in the establishment of the School tot Opleiding van Indische Artsen (STOVIA, School for the Education of Indigenous Physicians), and a School for Indigenous Midwives, both in 1851. STOVIA formed the core of the medical faculty (still in existence today) of the Universitas Indonesia UI), established in 1927, although at that time the UI did not yet exist. Bosch was also the first president of the Vereeniging tot Bevordering der Geneeskundige Wetenschappen in Nederlandsch-Indië (Association for the Advancement of the Medical Sciences in the Netherlands Indies), founded in 1851, a learned society that published a medical journal of the Indies.

The third scholar of this cycle of research is Pieter Bleeker, who was a medical doctor as well, and who also combined his activities as a physician with research and with activities as an administrator. Bleeker's research, however, was not only medical but also ichthyological, that is about fish. He seems to have published 770 articles in all, most of them dealing with fish species, a difficult act to follow in any field of scholarship. It seems that his work is still held in high esteem, given that his collected fish papers were reprinted as recently as 1973, almost one century after his death. Bleeker was also interested in the population figures of Java; one might call him a demographer *avant la lettre*. After 1845 he published very detailed population data that had previously been available only to the colonial bureaucracy, and he went on doing so for some 25 years, trying to establish Java's population growth rate.

He also played a prominent role in the socio-scholarly life of the capital of the Netherlands Indies, Batavia. In 1850 he was the most important founder of the Koninklijke Natuurkundige Vereeniging in Nederlandsch-Indië (Royal Association for Natural Science in the Netherlands Indies), which started the

[9] Although the names are somewhat similar, Willem Bosch and Johannes van den Bosch, Governor-General, Minister of Colonies, and mainly remembered as the architect of the Cultivation System, are not the same person, as Lewis Pyenson (1998:43) seems to think.

publication of a learned journal as well. Junghuhn was involved in these activities, albeit in a modest role. From around 1850 onwards, the *Verhandelingen* of the Batavian Society, of which Bleeker was secretary in 1853, no longer accepted contributions in the natural sciences, because the journal of the Royal Association could now publish these. Although apparently individual scholars such as Bleeker could belong to both 'cultures', the institutional separation in the colony between humanities and sciences was now a fact.[10]

In contrast to the cycle of research activities around 1820, when all initiatives came from the mother country, the activities around 1850 reflect the scholarly interests of the colony itself. It is probably not a coincidence that the revolutionary year 1848 had led to some unrest in Batavia, where the Creole community believed they were poorly represented in the colony's government. The scholarly community of Batavia now created the institutions needed for a fruitful and lively scholarly existence in the colony, a *Gründerzeit* – founding period – as Germans would call it. However, some of this rubbed off on scholars in the Netherlands too, and in 1851 the Koninklijk Instituut voor Taal-, Land- en Volkenkunde (KITLV, Royal Institute of Linguistics and Anthropology) was founded in the Netherlands, the institute that has been my employer for the last 17 years.[11]

Circa 1870

It could be argued that the next wave of research came in the 1870s. Among historians the years around 1870 are usually viewed as the beginning of the age of modern imperialism, and the Netherlands is no exception, although an older generation of historians thought it was. In addition to the Agrarian Law, dated 1870, which spelled the end of the Cultivation System and gave more freedom to private enterprise in the Indies, the war in Aceh, starting in 1873, is often cited as the beginning of Dutch modern imperialism in the Indonesian archipelago. The same year, 1873, saw the founding of the Aardrijkskundig Genootschap (Geographic Society) in the Netherlands, not so much a learned society as one designed to popularize the available knowledge of the Indies and other foreign lands. The Society, which later published a journal that was widely read, considered colonization of foreign countries by Dutch people as one of its aims, and it does not seem an exaggeration to call it a colonial lobby.

One of the most important names connected with the Geographic Society is that of P.J. Veth, originally a linguist. Later on, he developed an inter-

[10] Junghuhn 1853-4; Bleeker 1870; Sirks 1915:141-60; De Waart 1926; Borgers 1941; Willekes Macdonald 1950:3-8; Boomgaard and Gooszen 1991: 23-4; Klein 1995:15-6; Beekman 1996: 147-201.

[11] Nowadays the English name of the KITLV is Royal Netherlands Institute of Southeast Asian and Caribbean Studies.

est in geography and ethnology, finally becoming professor in Leiden in the geography and ethnology of the Indonesian archipelago. Although he would never see the archipelago with his own eyes, he published extensively on it and became known as an expert on everything Indonesian. He stimulated research in and about Indonesia, and he was one of the driving forces behind the Central Sumatra expedition of 1877, sponsored by the Geographic Society. The results of the expedition were published in the Netherlands in four volumes, with Veth as editor in chief.

This was a period during which a number of scientific expeditions and discovery voyages were made, although usually not on such a large scale as the Central Sumatra expedition. Strangely enough, initiatives taken by the Dutch or the Netherlands Indies governments for such expeditions were virtually absent, although if someone took the initiative, the government could often be persuaded to make funds available. This did not apply to one of the best known travellers, Alfred Russel Wallace, who during an eight-year period in the 1850s and 1860s visited the archipelago from one end to the other. He funded his travels entirely out of his own pocket, earning the required money by selling large numbers of specimens of exotic animals and plants to mainly British institutions. His observations during this period led to his discovery of what later would be known as the theory of evolution; his ideas were arrived at independently from Darwin, who had to publish his own book sooner than he had intended because otherwise Wallace's work on this topic might have been the first to appear.

Another decision taken in 1873, after more than a decade of foot dragging, was one that authorized the construction of the Koninklijk Magnetisch en Meteorologisch Observatorium (Royal Magnetic and Meteorological Observatory) in Batavia. The story begins in 1856, when C.F. Pahud, appointed governor-general of the Netherlands Indies, met the great scientist Alexander von Humboldt in Berlin. Humboldt had been mapping out a grid of locations for magnetic and meteorological measurements in faraway places, for which he had obtained support from Russia, Great Britain, and Germany. Humboldt, who asked Pahud for his support, suggested that Junghuhn, with whom he was in contact, could perhaps advise on possible locations for observation stations in the Indonesian archipelago. Pahud did contact the Ministry of Colonies, but it may have been C.H.D. Buys Ballot, professor at Utrecht University (and possibly known to some readers as the author of Buys Ballot's law), who was the main driving force behind this scheme, once it had been proposed by Humboldt. Buys Ballot's plan included a network of 12 stations throughout the archipelago, whose observations would be collected in Batavia and then sent on to Utrecht, where they would be analysed and published, thus contributing to Buys Ballot's little empire in geophysics. In 1858 the Ministry agreed in principle to send a scholar to the Indies for this work, and

in 1859 Pieter Adriaan Bergsma was appointed. However, Bergsma first had to assemble and calibrate his instruments, and it was not until 1861 that he sailed for Batavia. Measurements, on a daily basis, of temperature, atmospheric pressure, wind direction and velocity, intensity and duration of sunshine started in 1866, followed a few years later by measurements of rainfall, thus initiating a series of observations that, to my knowledge, has continued to this very day. However, the decision to construct a real observatory had not yet been taken, and Buys Ballot and Bergsma lobbied continuously for this station, unashamedly playing the nationalistic card. They argued that even Spain and the Rajah of Travancore were doing better, and that the whole civilized world would be indignant that the Netherlands, a country that had benefited so much from its possessions in the East, could not spare a few thousand guilders per year for this purpose. A positive decision did not come, as we have seen, until 1873.[12]

Now the facilities for carrying out the Humboldtian programme of data gathering were in place, as were some of the prerequisites of the early phase of an expanding empire.

Circa 1900

The next wave of research to be dealt with is that of the many and large scientific expeditions of the last decade of the nineteenth century and the first decades of the twentieth. These expeditions were often but not always combinations of the two cultures (the humanities and the exact sciences) for which the Central Sumatra expedition had been the model. It is a period during which government funding was available on a structural basis, while the organization and the initiative were usually left to learned societies. There were several large expeditions to Kalimantan, Sulawesi and Papua – or, as these regions were called then, Borneo, Celebes and New Guinea – but also one that had the seas as its focus. This was the well-known Siboga expedition from 1898 to 1900, named after the ship that transported the members of the expedition, headed by Professor Max Weber (the naturalist, not the social scientist).

It seems logical to see a link between these expeditions and the expansionary phase of the colonial state of the Netherlands Indies, which in these years was expanding throughout the so-called Outer Provinces, a process that was more or less rounded off by the eve of the First World War. It was a phase of colonial expansion, but at the same time one of collaboration between Dutch scholars in the Indies and those of many other nationalities. The expeditions just mentioned bear witness to such collaboration, as do the activities of Melchior Treub, the scholar who headed the Botanical Gardens at Buitenzorg from the 1880s. In 1885 he established a separate laboratory in the Gardens for

[12] Wallace 1869; Veth 1881-92; Sirks 1915: 160-82; Willekes Macdonald 1950:9-13; Pyenson 1989:83-132; Klein 1995:12; Van der Velde 2000:229-62; Wentholt 2003.

foreign visiting scholars, an institution that over the years attracted large numbers of scholars. Part of Treub's success was that he convinced the governments and national academies of many countries to supply funding for these trips.

Treub was also the person who drastically reorganized the Botanical Gardens, creating an institution that was much more geared towards the needs of a colony where large- and small-scale agriculture were the most important sectors of the economy, and where increased production and productivity were of paramount importance. This whole process culminated in 1905 in the renaming of the Botanical Gardens and all the laboratories and experimental agricultural stations that had accrued to them over the years. Henceforth it would be called the Department of Agriculture, after its United States model, with Treub, of course, as its first director.

However, even Treub and his institutions could not do all the research that was required by the many large-scale agricultural establishments (plantations) in the hands of private enterprise. This became clear when, in the early 1880s, the 'sereh disease' attacked the sugarcane fields of Java. Treub did not have the time to seriously investigate this outbreak, and in the late 1880s the association of sugar-millers established three experimental stations for sugarcane alone, paid for entirely by the industry itself. After several reorganizations – in the course of which one of the stations was abolished – the remaining stations came under a single director, in 1905. Research carried out here was, as could be expected, all applied research, covering every aspect of the process of sugar production. It dealt, therefore, with technical questions related to the milling process, in addition to chemical questions, but the most successful contributions of the experimental stations for sugarcane may have been those in agronomy. They not only succeeded in producing crossbred varieties that were resistant to the sereh disease, they also produced breeds with much higher yields per hectare than the old ones. This was the case particularly with the POJ 2878 variety, developed around 1920, which gave the Java sugar industry an edge over its competitors. The experimental stations employed people with doctorates in botany and zoology, as well as graduates of the new State Agricultural School in Wageningen, whose training was more in applied science. A number of directors of the experimental stations (V.J. Koningsberger, F.A.F.C. Went) later became biology professors at Utrecht University.

An expanding empire needed healthy subjects, including healthy soldiers to fight its colonial wars. It is hard to think of a better symbol of science in the service of empire than that of the medical doctor Christiaan Eijkman, for some time director of STOVIA, who was awarded a Nobel prize. This was given to him for his discovery of the basic mechanism of vitamin deficiency that caused the dreaded beri-beri disease, a constant drain on the human resources of the army. Eijkman published the decisive article that landed him the Nobel prize in the *Geneeskundig Tijdschrift voor Nederlandsch-Indië*

(Medical Journal of the Netherlands Indies) in 1896.

But it was not only applied science in which scholars of this time period excelled. One example may suffice, that of the physician E. Dubois, who as an amateur palaeoanthropologist found part of a skull in 1891 near a place called Trinil in Java. Dubois thought he had found the missing link between apes and humans, and he called this link *Pithecanthropus erectus*. For a short period, the thought could be entertained that Java was the cradle of humanity; nowadays we regard these remains as an early specimen of *Homo erectus* in Asia. After Dubois's return to the Netherlands he became a professor at the University of Amsterdam and a curator of the fossil collection at Teyler's Museum in Haarlem. He published extensively in the Proceedings of the Royal Netherlands Academy of Arts and Sciences.

Finally, talking about skulls, it is difficult to avoid mentioning skull measurements, one of the more notorious features of physical anthropology. This was a time when the expanding empire and the many scientific expeditions enabled those scholars interested in ethnic groups – or, as they would have been called around 1900, races – to carry out large numbers of measurements among groups living in faraway places, particularly in Borneo and New Guinea. The name that comes to mind in the study of ethnic groups of the Indonesian archipelago is J.P. Kleiweg de Zwaan, later a researcher at the Royal Tropical Institute in Amsterdam and professor of anthropology and prehistory at the University of Amsterdam.

For obvious reasons, this type of research, which was continued in the 1920s and 1930s, was no longer fashionable after the Second World War. Less well known is that it was equally unpopular before the late nineteenth century. Before then the term 'race' was mainly applied to animals, not to humans, which does not necessarily mean that racial prejudice and exclusion were absent. However, with the advent of modern imperialism and social Darwinism the term 'race' and the research connected with it came into their own.[13]

The 1920s

The final cycle of research during the colonial period is that of the 1920s. This decade is often called the heyday of the late colonial state, wedged in between the end of the rounding off of the empire and the end of the First World War on the one hand, and the Depression of the 1930s followed by the Second World War and the Indonesian Revolution, on the other.

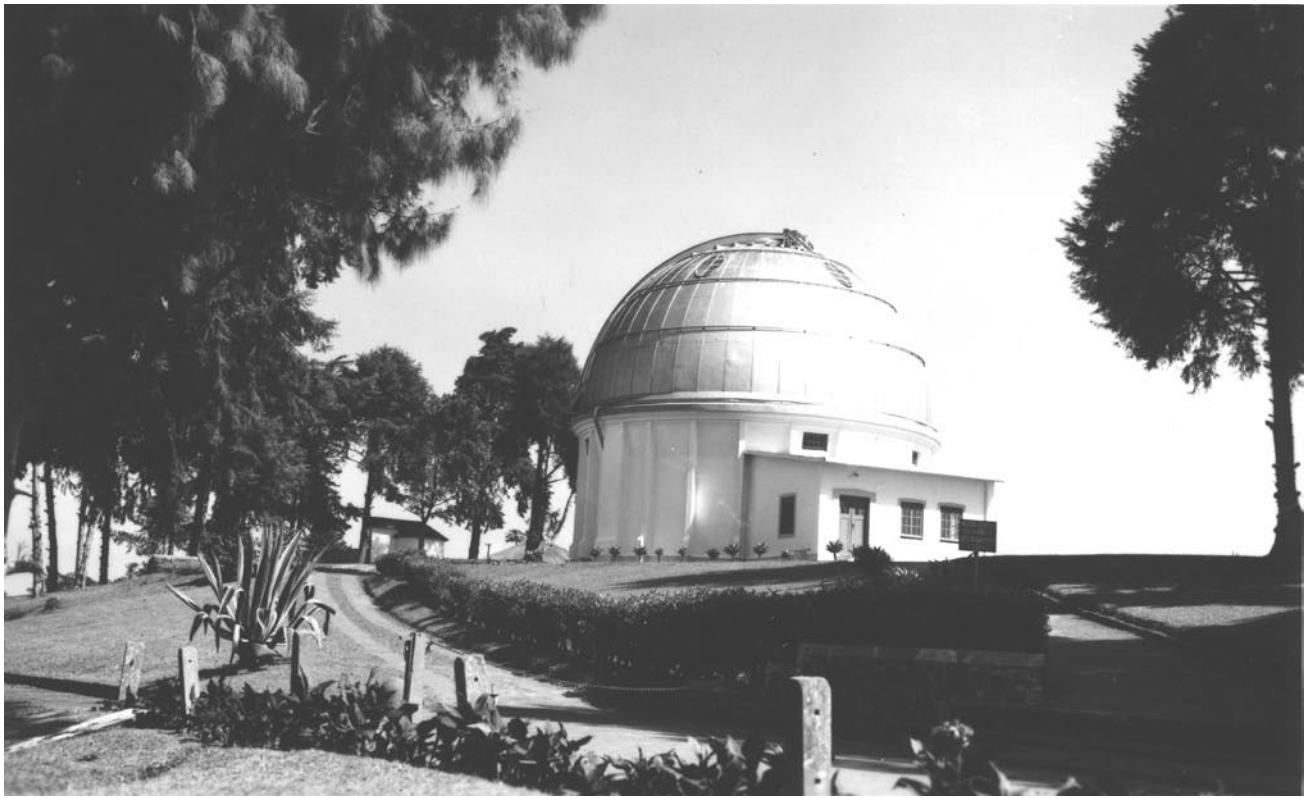
This period was primarily one of institution building and consolidation

[13] Sirks 1915:169-82, 196-215, 262-4; De Beaufort 1929; Van der Mandere 1928: 160-4; Kleiweg de Zwaan 1929:193-4; Dammerman 1945; Weidenreich 1945; Willekes Macdonnal 1950:13-7; Jansen 1959; Brockway 1979:70; Pyenson 1989:11-2; Bellwood 1997:39-68; MacLeod 2000:9; Maat 2001: 66-82.

of existing institutions. The empire had reached its last frontiers, and now, as part of the Ethical Policy, it was time to establish or upgrade institutions of higher learning for the indigenous population. Moreover, during the First World War, when Indonesia and the Netherlands had been separated for four years, there had been a tremendous shortage of academics. In 1920, private initiative established the Technische Hoogeschool (Institute of Technology) in Bandung, still to be found there today. Indonesia's first president, Soekarno, graduated from this institute in 1926; it seems they offered him a job there as a teacher, which he declined. In 1924, the institute was taken over by the government. In the same year the Law School was established in Batavia, the nucleus of the later Faculty of Law of the Universitas Indonesia. STOVIA was converted to a fully-fledged medical faculty in 1927.

Another institution, founded around the same time, was the Bosscha Observatory, also in Bandung. The observatory was named after the rich tea planter K.A.R. Bosscha, who paid for the construction and outfitting of this institution largely out of his own pocket. Karel Bosscha was a son and grandson of professors, while on his mother's side he was related to wealthy Dutch planters in the Priangan (western Java). This is the extended family described by Hella Haasse in her novel *Heren van de thee*. Karel Bosscha's father was a physicist interested in astronomy, an interest that his son inherited. Bosscha, who feared that the astronomers of the Leiden observatory would attempt to control the running of the observatory in the Indies as well, first established a learned society, the Netherlands Indies Astronomical Association. The vice-president of the Council of the Indies was honorary chairman of this society, another honorary member was a rear-admiral, the president of the Javasche Bank served as a member of the board, which included other local Dutch chief executive officers among its members, while Bosscha was the chairman. The director of the Bosscha Observatory was Joan Voûte, a Creole Dutchman born in Java who had been educated in the Netherlands, where he had been trained as an astronomer at the Leiden observatory. This observatory, therefore, and its director, clearly represented the Creole element in this community, and although there were friendly connections with Leiden, there was also a constant suspicion that Leiden would attempt to take over the place. It was an institution that had the freedom to apply itself to theoretical science, something that was often difficult to attain if an institute was government funded. In that sense it was doubly emancipated – from the meddlesome mother country and from the need to earn its keep with applied science.

Another scholar passionately interested in theoretical science was Jacob Clay, physicist and philosopher, and the first director of the Institute of Technology in Bandung. In his inaugural address at the Institute, he emphasized that theoretical science was a civilizing force; nothing would unite humanity more than the search for truth. His own research was in all respects



Bosscha Observatory, Lembang, West Java, circa 1925 (KITLV, 26059)

rather spectacular, at the cutting edge of radiation studies. In Bandung he launched balloons packed with state-of-the-art technology for the measurement of cosmic rays, something he appears to have been better at than the American Nobel prize laureate Robert Andrew Millikan, who carried out measurements during the same period.

Sophisticated technology was also involved in one of the last voyages of discovery in the colonial period, the 'Snellius' expedition, more precisely the Snellius I expedition, at least that is the name it was given in hindsight. As with the Siboga expedition, it was named after the ship that transported scholars and equipment, in this case *H.M.S. Willebrord Snellius*. During 1929 and 1930, the team investigated the deep seas of the archipelago and the adjoining oceans, carrying out research in oceanography, geology, biology, and meteorology. The results appeared much later in a multi-volume publication.[14]

Institution building, a strong Creole tendency, and advanced, theoretical science assisted by state-of-the-art technology sums up the more spectacular developments of this period, the heyday of the late colonial state.

The long goodbye (1930-1970) and its aftermath

After 1929, it was no longer business as usual for the scholarly community with an interest in the Indonesian archipelago. The long Depression of the 1930s, the War in the Pacific, the Indonesian Revolution, and the further breakdown of Indonesian-Dutch relations between 1949 and 1958 were all instrumental in creating a downward trend in Dutch research on Indonesia. Although some Dutchmen stayed in Indonesia even after 1958, and although Indonesia was still being studied in the Netherlands, the late 1950s and most of the 1960s must be regarded as the nadir of Indonesian studies carried out by Dutch researchers. Since the late 1960s relations have improved considerably, a process in which my institute, KITLV has played a role, I am happy to say.

Nevertheless, Dutch 'tropical' science – and the same thing holds true for the humanities – as applied to Indonesia never recovered from the shock. Those who had studied at university with a view to a scholarly career in or on 'the Indies' had to find other regions where they could ply their trade, and many of them turned to Africa, Latin America, or the Dutch West Indies, or specialized in other Asian countries. Many university departments where disciplines relevant to research in Indonesia were taught had to scale down their programmes, sometimes even decades after the 1950s. In that sense, 'tropical science' as applied to Indonesia, after being around more than 300 years, was 'unmade'. However, it did not disappear entirely.

[14] Jonkers 1948:179-81; Van Riel 1948:136-7; Pyenson 1989:56-82, 118-9, 144-9.

I will not dwell on the period of recovery, but three conspicuous projects should be mentioned. They are symbols of both the new spirit of collaboration, and of long-term continuity. I am referring to the Flora Malesiana, the PROSEA (Plant Resources of Southeast Asia) project, and the Snellius II expedition.

The Flora Malesiana and PROSEA are very similar projects, based largely on botanical research that had been carried out from Bontius and Rumphius's time onward. The Flora Malesiana started earlier, immediately after the Second World War, and encompasses all plants of Malaysia, Indonesia, and the Philippines, while PROSEA (1985-2003) dealt with 'useful' plants only, covering the whole of Southeast Asia. Both projects profited from the collections and publications of famous botanists who had worked in Malaysia and Indonesia during the late colonial period, such as K. Heyne and I.H. Burkill.

The Snellius II expedition took place during 1984 and 1985. What had changed in comparison to Snellius I was that this was a collaboration between scholars of two independent nations. We are left to speculate whether there will be a Snellius III expedition, and if so, when. The time passed between Siboga and Snellius I was about 30 years, and that between Snellius I and II was 55 years, which might suggest that some of those reading this article may not live to see that day.[15]

Epilogue

A few concluding remarks. There is an enormous difference in the content and tone of the writings of Dutch historians of science produced at the end of the colonial period, and much of the literature produced today on 'colonial science' or 'science and empire' in general. Whereas Dutch scholars who were basically reporting on their own recent past around 1950 were rather congratulatory about what had been achieved, most present-day writers are much more critical. In my article I have mentioned some of the points that are made nowadays, but others are of such a global and sweeping nature that it seems more appropriate to deal with them in my closing statement.

In the first place, colonial arts and sciences are seen as the handmaidens of empire, and as colonialism and imperialism were bad, how good can colonial science have been? This argument consists of various elements that should be disentangled. Physicians, for instance, enabled colonial armies to function properly, and they were also supposed to make the tropical world safe for white men (and, later, white women), and, in doing so, they imposed Western notions of hygiene and from the late nineteenth century onwards the preventive and curative measures that came with the germ theory of disease.

[15] Heyne 1927; Burkill 1935; De Witte 1985; *NRC Handelsblad*, appendix Wetenschap & Onderwijs, 31 May/1 June 2003, p. 37.

The latter element is quite close to a second feature to be found in the recent literature, which emphasizes the nexus between power and knowledge, a nexus that turns upside-down our notion that knowledge begets power. It is argued that those who have power can impose their knowledge on society and even impose the categories of thought that are used to create knowledge. This is not very far removed from the Orientalism argument of Edward Said in the late 1970s. Western scholars had created 'the Orient', converting their prejudices and fantasies into a system, and then used this system as a point of departure for their research and teaching. By emphasizing the Otherness, as it is called nowadays by cultural studies people, of tropical areas, a tropical science was created where none had existed before, and where, according to some scholars, none should have existed. Over the last 30 years or so, most scholars have emphasized the universal character of human society, which should imply that the humanities and the sciences should be universalistic too.

A third point is that the view that Europeans and Americans introduced Western arts, sciences, and technology to the East is too one-sided. There has always been an exchange, a traffic of ideas. Western thinking and Western technology were influenced and stimulated at an early stage by Chinese, Indian and Arabic learning, which, in turn, had adopted notions from the Greek and Roman civilizations.

And finally, in so far as Western ideas had prevailed, they had, according to recently formulated arguments, often done more wrong than good, riding roughshod over local solutions and local technologies well adapted to their micro-environments, replacing them with generalized blanket solutions and technologies.[16]

I think that many of these notions, though sometimes grossly exaggerating and oversimplifying the phenomena they deal with, are a useful corrective to the triumphant reports dating from the period around 1950. The elements I have stressed in my story are more in line with the notion that we should study the social history of scholarship in order to get rid of the notion of science as a somehow disembodied activity undertaken for the greater good of humanity. I am certainly not going to deny that many scholars have been motivated by noble ideals, but as an explanation for various developments in the humanities and the sciences, such an approach is highly inadequate. I have attempted to place scholars in the context of their time, and all that that implies in terms of motivation, funding, career patterns, the role of the state and of learned societies and journals, and the many international contacts that would shape the future of these scholars and of the sciences as we know them today.

[16] Said 1979; Adas 1989; Low 1989; Cohen 1991; Arnold 1993; Cohn 1996; Scott 1998; MacLeod 2000.

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