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Natural History in New Zealand: The Legacy of Europe[1]

JOHN ANDREWS[2]

ABSTRACT: European explorers and naturalists made many contributions to the discovery and description of New Zealand's natural history. These contributions are examined with respect to the scientific traditions of England, France, and Germanic Europe. Underlying differences between these countries had a notable effect on science in New Zealand. Some countries regarded science as linked to colonization. Others believed that even on the periphery, science could be pursued for its own sake.

ALMOST A CENTURY spanned the period from Cook's first landing in New Zealand to the foundation of the New Zealand Institute and the Colonial Museum—a period that saw visits by scientists and expeditions from several countries, but principally from England, France, and German-speaking parts of Europe. Irrespective of their motives for coming to New Zealand, their legacy of discovery in botany, zoology, and geology was fundamental to the scientific, economic, and cultural advancement of the developing colony. The manner of their investigations, the circumstances in which they undertook them, and the nature of their product varied considerably. In part, this could have been due to the fleeting nature of a visit, or to the fact that science was not central to a given mission. But where science *was* central, we can detect significant differences in the ways in which different European cultures executed their scientific business in New Zealand.

Such differences could arise from differences in training and intellectual background, methods of scientific organization and practice, and levels of resources. To a greater or lesser extent, the relationship between what may be described as "national character" and national differences in science has been discussed for some time. Merz (1897), Salomon (1971), Schroeder-Gudehus (1990), and Jordanova (1996, 1998) have examined the relationship between science, nationalism, and internationalism. It is generally agreed that although European science was "cosmopolitan" from at least the seventeenth century, it was not until the late nineteenth century that a comprehensive ideology of "scientific internationalism" became part of European scientific endeavor (Jordanova 1998). Even then, the idea of internationalism, with its emphasis on humanity and benefaction, was repeatedly "balanced and qualified by the rhetoric of nationality." The practice of science and its underlying commitments were broadly similar in different countries and cultures, but the fields, styles, and outcomes could be expected to reflect national differences.

Selecting for close examination the history of zoological and botanical exploration, the following questions are asked in this paper: Do different countries' contributions to the scientific knowledge of New Zealand during the first century of European contact differ in any distinctive way, and if so, what is their underlying basis? Were they closely linked to the colonizing purpose?

The development of European science did not exist in isolation, but was embedded in imperial, cultural, and commercial aspirations. It may be useful to consider the nature of New Zealand science against a matrix reflective of these different processes and values (see Table 1).

In botany and zoology, scientific practice has determined that a species follows a path from collection through to identification, de-

[1] Manuscript accepted 1 November 1999.
[2] School of Biological Sciences, Victoria University of Wellington, Wellington, New Zealand.

TABLE 1

Processes and Values in the Development of European Science

	ECONOMIC VALUE	CULTURAL VALUE
Utilization and end point	Medicinal, food, fiber, decorative, or other material values for trade or consumption	Scientific curiosity, representation in art, literature, etc., sense of appropriation and "ownership" (collections, knowledge base)
Processes and pathways to utilization and end point	Collection, identification, evaluation, description, analysis, experimentation (e.g., transportation), scientific communication (publishing)	Collection, identification, evaluation, description, education, entertainment, collections, transport and communication in literature, art, etc., publication

scription, and publication. But a species is not solely the property of science; it achieves possibly more than one end point, having both cultural and economic value. Latour (1987) discussed the mobility, stability, and combinability of objects and information. Mobility refers to the ease with which objects (species) can be transported; stability refers to the degree to which the species can remain in a recognizable state; and combinability is the facility with which species can be recombined, resorted, and therefore reevaluated. This theme was explored by Miller (1996) and Stemerding (quoted in Miller 1996) where, in a Latourian analysis, a "spectrum of activity" in plants and animals is described. The degree to which these qualities are possessed by different species largely determines their transmission from discovery to utilization.

In botany and zoology, the tools with which analysis is conducted and economic and cultural potential realized range from collecting instruments and materials to methods of representation and publication. Particularly significant, however, is Linnaean taxonomy. Systematic classification and description are not ends in themselves, but rather lay the foundation for studies of origins, relationships, and distribution and provide a stable, consistent, and widely accepted system that crosses cultural boundaries. Linked with publication, taxonomy extends stability toward mobility, allowing scattered material to be recombined, resorted, and classified in an orderly, efficient way. Publication in print and pictorial representation also provides stability of information, especially in cases where species are prone to deterioration or loss. A species may pass through several different processes, including transition from a live specimen to one that is preserved, thence into print, written and illustrative, in the scientific or popular literature.

Time is also vital to the stability of specimens. Certain species (plants, shells, insects) are more resistant to decay than others (e.g., soft-bodied invertebrates and fish). More stable forms are more mobile and can be combined or recombined more easily, although their stability can be a disadvantage when collections are easily dispersed. Less stable forms need the stabilizing process of classification and publication more urgently. It can be predicted that species that have stability and mobility will be published out of proportion to their representation in the biota. In the context of New Zealand natural history, these factors were significant to "who" described "what" and "where."

Between 1769 and the end of the nineteenth century, the exploration of New Zealand's natural resources comprised several distinct but overlapping phases (Andrews 1986). These included periods characterized by (1) exploring expeditions and accompanying naturalists; (2) missionaries, a number of whom were skilled or interested in natural history; and (3) surveyors; followed by (4) local scientific enterprise. There were also many itinerant visitors who came and went for commercial reasons or curiosity, some adding to natural history knowledge by the way. Europeans were given significant help by the Maori, whose knowledge of natural history built upon learning acquired over 800 years.

The value of botanical and zoological work can be measured in collections, diaries and accounts, books and journal articles, natural resources catalogs, and the educative. Quantifying these things is difficult, but we can make some broad assumptions. We know more or less what Europeans collected or overlooked; we know the fate of some of their collections; and we know that collections, although having some intrinsic value, have to be worked up before they are of use. There is the published record and the knowledge base, and the natural productions of New Zealand that were dug up or harvested for commercial exploitation. These factors give us some appreciation of the relative value of the exploratory effort and the driving forces that made it successful.

THE GERMANIC COUNTRIES

Within this category, I include the German and Hapsburg Empires, including Austria and part of Denmark. The leading characteristic of their contribution is its individual nature. Only one expedition came from this part of Europe, the *Novara* Expedition (1857–1859), and its major contribution to the understanding of the New Zealand biota came with a single individual, Ferdinand von Hochstetter, who left the ship on its arrival in New Zealand. The Forsters, Johannes and George, may be included in this category; although naturalists on Cook's second voyage, their origins were German (Andrews 1986). The Forsters made a substantial collection of New Zealand plants and animals, together with drawings of many species. Their troubled circumstances ultimately forced the sale of the drawings and some of the specimens, and others they gave away (Whitehead 1969, Hoare 1976, Andrews 1986). However, they managed to publish several accounts of natural history relevant to New Zealand, including *Characteres generum plantarum* (J. R. Forster 1776), *A voyage round the world* (J. G. A. Forster 1777), and four other works. The manuscript of the *Descriptiones animalium* (J. R. Forster 1844), although hugely delayed in publication, contained descriptions of 37 New Zealand species that were opportunistically used by many contemporary authors. Although these are patchy in their coverage of the New Zealand biota, they outstrip the published (biological) scientific record of the other Cook voyages.

Moving to the Continent, we encounter Johann Fabricius, born in Schleswig and professor of natural history, economy, and finance at Kiel. His entomological studies required him to travel to every corner of Europe to inspect natural history museums and private collections. He was the first to describe (according to Linnaean taxonomy) New Zealand specimens from the *Endeavour* voyage, as well as insects that were possibly collected by the Forsters (Fabricius 1775 and five further publications). New Zealand insects and crustaceans were also to appear in the publications of Herbst (1782–1804, 1783–1806) of Berlin, including the earliest known illustrations of New Zealand insects.

Mollusks (shells) from the Cook voyages have a complex, even tortuous, history of collection, distribution, and description (Andrews 1986). However, it is indisputable that a long list of German workers, or those with German connections, were influential in describing the mollusks from New Zealand. These workers engaged fellow countrymen in London to assist them. Apart from the Forsters, we can mention Karl Woide, a classmate of J. R. Forster at the Joachimsthal-Gymnasium in Berlin and pastor to the Dutch and German communities in London, who was a go-between, linking Joseph Banks and his collections and Friedrich August Zorn von Plobsheim in Danzig. Zorn was curator of the natural history collections of the Gesellschaft der Naturforschender Freunde and he and others published (non-Linnaean) descriptions of the New Zealand shells in the society's journal, *Der Natur-*

forscher (Walch 1774, Zorn von Plobsheim 1775, Spengler 1776, 1782, Chemnitz 1783). The first valid description of a New Zealand shell (also in *Der Naturforscher*) was by Hermann (1782). Friedrich Martini, a contemporary of Walch at the University of Jena, was involved in the publication of a large compilation on mollusks that also included New Zealand material (e.g., Martini and Chemnitz 1781, vol. 5). Other New Zealand shells, from the collection of a Hamburg physician, Dr. J. F. Bolten, were given scientific names by Röding (1798). Despite the widespread use of vernacular names, the publication effort from this group of largely German-born and educated naturalists was considerable, especially given their distance from sources of material.

Because Cook voyage specimens, drawings, and unpublished descriptions of species circulated widely, there was ample opportunity for compilers to descend on this material and, if they adopted Linnaean nomenclature, to write themselves into the permanent scientific record. Johann Friedrich Gmelin was the most notable of these: a descendant of a long line of German scientists, and a professor of medicine first at Tübingen and later at Göttingen, Gmelin was famous for revising Linnaeus' *Systema Naturae* (13th ed., 1788). In so doing, he swept up a number of invalidly named New Zealand species, including a number of birds. In similar fashion, Marcus Bloch described and named a number of the New Zealand fish collected by the Forsters (Bloch 1801). Reliance on manuscript material rather than specimens or drawings meant that mistakes were made, although several Bloch names survive to the current day.

Although the late eighteenth and early nineteenth centuries were the most important period of the German contribution to New Zealand natural history, the tradition continues through The New Zealand Company surveyor Ernst Dieffenbach, who was born in Giessen and educated in Giessen and Zürich. He reached New Zealand in August 1839 on the New Zealand Company vessel *Tory* and began a survey that concentrated largely on the North Island, but was more comprehensive than anything that had preceded it. His observations were directly linked to the process of colonization (Dieffenbach 1843).

The Austrian Ferdinand von Hochstetter was a graduate of the University of Tübingen. He was appointed as a geologist to the *Novara* Expedition and arrived in New Zealand in 1859, where he was invited to carry out a geological survey. He left the expedition for 9 months, during which he amassed a collection of natural history specimens, including paleontological material, much of which went to the Imperial Museum in Vienna. Included was the rare native frog (described by Fitzinger 1861) and an important collection of invertebrate species, many of which gave rise to published descriptions. This and his geological contributions would have been enough, but Hochstetter was also a teacher and of great assistance to the fledgling scientific community and colony (Hochstetter 1863). Contemporary with Hochstetter was Julius von Haast, who arrived as an immigrant and became one of the foremost figures in New Zealand science. Other Germans contributing to local science were Georg Ritter von Frauenfeld and Johann Zelebor, both zoologists on the *Novara.* Germans and Austrians continued to come after New Zealand became an established colony with its own scientific base. Andreas Reischek (a formidable collector), Robert von Ledenfeld, Otto Finsch, and Professor H. H. Schauinsland were among them. The latter two, successive directors of the Bremen Museum, used commercial vessels for themselves and their specimens (Andrews 1986).

The German contribution to the biology of New Zealand is probably unsurpassed by any other nationality, if we leave aside expeditions and collections. Why was this so? The answer may be simply given: well-trained individuals, networks, and the German universities; and underlying these three things, the fragmentary nature of the German states, principalities, free cities, bishoprics, and other territorial entities before the formation of Empire. Imperial ambitions played a more subdued role.

"No people gave more thought to the development of the university system than the Germans" (Bryce in Merz 1897). Of the 20 major universities established before the end of the nineteenth century, 15 existed before the end of the eighteenth century, and many well before (Holland 1911). Their wide geographic distribution reflected their foundation by princes, dukes, margraves, electors, and others spread across Germanic Europe, which created a network of higher learning, rather than a university culture focused on one or two major urban centers. It was not a stationary academic community, but one where students and staff moved between institutions, both in Germany and the surrounding countries (Merz 1897). This seems to have encouraged a certain independence and individualism. Private study and research, particularly the latter, were favorably regarded, and there was a degree of "self-renouncing diligence and singleness of purpose" (Merz 1897). Some of the earlier German naturalists were pastors or trained in theological faculties, in itself a reflection upon the relatively poor state of the medical faculties of the day. The philosophical faculties, followed by the medical faculties, gained strength throughout the nineteenth century (McClelland 1980), which was reflected in the educational backgrounds of those who followed. All these faculties took biology under their wing.

I would argue that the lack of any centralized academy, academic union, or organization helped encourage the development of many different scientific societies and periodicals, such as the Gesellschaft der Naturforschender Freunde of Danzig and Berlin, and Der Naturforscher. Competition among the German universities became a key element in the development of the natural sciences (Ben David 1977), However, until the late nineteenth century, the many different Germanies lacked the means or method to employ the natural sciences to drive overseas colonial expansion. German colonialism becomes a feature in science, and the South Pacific, only from the late 1880s. The *Novara* Expedition, sponsored by the Archduke Maximilian, had imperial overtones, but these were scarcely noticed in New Zealand.

The Germans dealt in specimens that were more or less "stable," such as shells and insects that had hard parts less subject to decay; or, in the case of compilers such as Gmelin, specimens that had been "stabilized" in print. This was inevitable, given their distance from the original sources of material. In character, the German contribution leaned toward the cultural side of the matrix in Table 1. There was nothing perceived of great commercial or economic value in New Zealand plants or animals, so their work was directed at a more cosmopolitan array of interests. But by publishing as they did, they stabilized the information, making it possible for it to be moved around, reordered, and combined in later compilations and more cohesive studies.

FRANCE

If we set aside the preliminary encounter with the New Zealand biota made by Jean de Surville and his officers on the *St. Jean Baptiste* in 1769, the French connection with New Zealand natural history began with Jacques de Favanne and his son Jacques Guillaume in 1780 (Dezallier d'Argenville 1780). This featured some New Zealand material in a compilation of shells made by Pierre Broussonet (1780) and Bonnaterre (1788), who were collectively responsible for the first scientifically valid description of a New Zealand fish in Banks' collection. They were followed by Guillaume Antoine Olivier, whose entomological descriptions (1789–1800) contained New Zealand species probably based on Banks' material. Given the geographical proximity of the French to Banks' collections, more might have resulted but for the French Revolution. Some assistance was given by go-betweens such as Sarah and Thomas Bowditch, who, using Forster and other Cook expedition drawings, managed to get New Zealand fish into the enormous ichthyological treatise by Cuvier and Valenciennes (1828–1849). Even so, the contribution to New Zealand natural history by early French naturalists was not great.

An altogether different outcome came

with the three French voyages of exploration under Louis-Isidore Duperrey and then Dumont d'Urville and Charles Jacquinot between 1822 and 1840. The voyages resulted in the collection of many species across the range of the New Zealand biota. An account of each voyage was published in a series of sumptuously illustrated atlases by the voyage naturalists—Renée Lesson and Prosper Garnot on *La Coquille,* Quoy and Gaimard on *l'Astrolabe,* and Jacques-Bernard Hombron and Honoré Jacquinot on *l'Astrolabe* and *Zelée* (Duperrey 1826, 1828–1838, Dumont d'Urville 1830, 1830–1833; subsequent voyage reports are listed in Andrews 1986). In each case, naval officers, several of whom had training in the natural sciences, assisted the naturalists.

These expedition reports represent the first coherent accounts of New Zealand natural history, well illustrated and published according to the widely accepted Linnaean taxonomic convention. These expeditions did not, however, mark the end of French collecting in New Zealand. The tiny French colony at Akaroa and the French naval vessels that kept watch over the whale fishery, the colonists, and the Catholic missions were a steady source of material for the Muséum d'Histoire Naturelle. Sainte Croix de Belligny, the colonists' leader, was a naturalist appointed as a traveling correspondent to the Jardin des Plantes in Paris, and Etienne Raoul, surgeon on the corvette *L'Allier,* was a notable collector (Andrews 1986).

How did the French effort differ from that of the Germans, and why? The French provided more polished and comprehensive scientific accounts partly because of experience and timing. This was not their first expedition, and it was more than 50 years after Cook first set sail that Duperrey followed suit. But this is not the whole picture. It can be argued that state funding of science since the creation of the Paris Academy in 1671 gave the French a head start. The Royal Society of London was a gathering of sometimes wealthy individuals, but the Paris Academy forged ahead with state-sponsored scientific surveys throughout the kingdom and its dependencies (Merz 1897). With the development of a research culture, science flowed through to teaching institutions and to the wider population (Merz 1897). Buffon, who was keeper of the king's gardens and the Royal Museum, might have been responsible for "a vastly long look at nature, an immobility in the centre of the world . . . a monument of books built on demolished truths" (Gaillard in Mançeron 1983), but his works had an enormous public impact. Whereas it has been argued that the Germanic nations relied upon their networks and universities for the dissemination of knowledge (Holland 1911), the central role of the Academy in France encouraged those who could bring science to the public (Merz 1897).

Equally critical to the scientific culture of France were the Jardin des Plantes and the Muséum d'Histoire Naturelle, which housed large collections and conducted courses in natural history. The Muséum d'Histoire Naturelle was particularly significant to the recording of New Zealand natural history, because many of the specimens collected by the major French voyages were held there, following a directive from the Secretary of the Navy issued to stem the tide of private collecting and disposal (Wright 1950). This to some extent overcame the problem experienced in England, where much of the material from Cook's voyages was held privately by Banks, who was generous in disposing of it to others. In contrast with Germany, the role of university teachers in holding or describing material from the expeditions was more limited. But as early as Colbert, the French recognized the power of science in achieving imperial ambitions (Merz 1897). An underlying imperial purpose was implicit in the French expeditions. A French colonial beachhead was established in New Zealand, coinciding with the conclusion of Dumont d'Urville's last visit to New Zealand. As the naming of things implies appropriation and ownership, so the cataloging and description of plants and animals became part of the process of cataloging future resources, as well as satisfying scientific curiosity.

The superior organization of the French carried their natural history work to publication. Less "stable" species were accommodated and found their way into the scientific literature. The French addressed both sides of the matrix in Table 1; their work subscribed to both economic and cultural value, although with an emphasis on the latter, because most New Zealand species with obvious economic significance—and their numbers were not large—were exploited before the French arrived in force.

GREAT BRITAIN

It was the British who began the process of cataloging in New Zealand that, through successful colonization, fixed the allegiance of colonial science. With their meshing of scientific and colonizing interests, the British might have produced a well-ordered and polished description of natural resources. Such was not always the case.

In scientific outcomes (well-preserved and cataloged specimens, accurate and timely published accounts), the Cook voyages were at best a qualified success. Many of the specimens, drawings, and unpublished natural history manuscripts from the three voyages met an unhappy fate (Lysaght 1959, 1979, Stearn 1968, Whitehead 1968, 1969, 1978, Medway 1976, 1979, Andrews 1986). Systematists from Linnaeus to present-day biologists bemoaned the fate of voyage material and the absence of publication. Opportunism, combined with the generosity of Banks and the growing markets for curiosities, brought the more stable material to the hands of willing European naturalists.

Without Banks (Mackay 1979, Miller 1996, Gascoigne 1998), things might have been worse. It would be many years before the British Museum became a place to house specimens, so a private collection stood at least as good a chance of remaining intact. It would have taken an army of experienced naturalists to describe the thousands of specimens collected and a sizeable fortune to publish the results. As it was, Banks and the loyal Solander toiled away on his manuscripts, while a clamoring throng of visitors, correspondents, collectors, and agents, anxious to get their hands on voyage specimens, picked over the spoils.

With respect to New Zealand material, it was easy to overlook its scientific interest and find little of immediate economic value. Perhaps Banks had already summed up what was valuable in New Zealand: flax, timber for spars, a base for sealing and whaling, and not much else, apart from a land of temperate climate that could one day accommodate colonists and their portmanteau biota. An ability to sift out commercial possibilities may have led him to take a more principled view toward the sharing of knowledge and specimens with the "Learned in different Countries," although there was no doubt about his rivalry with the French in dividing up the world's flora (Gascoigne 1998). This competition was alive toward the mid-nineteenth century, because national pride in science had in some quarters replaced the quest for commercial advantage (Andrews 1986).

Apart from the discovery of the remarkable kiwi in 1811 (Andrews 1986), subsequently described by Shaw and Nodder in 1813, English efforts to piece together the New Zealand fauna and flora in the early decades of the nineteenth century rested largely upon colonists and representatives of the Church Missionary Society. The *Erebus* and *Terror* Expedition under James Clark Ross arrived in New Zealand in August 1841, and their naturalists, Robert McCormick, John Robertson, Joseph Hooker, and David Lyall, armed with instructions from the Royal Society, spent 3 months collecting specimens. The British Museum (Natural History) benefited greatly from their collections, but the publication of results was a saga of muddle and delay, taking over 30 years to be completed.

Of greater significance were the networks that sprang up between the missionaries and the colonists in New Zealand and their contacts in England—the most important of whom was Richard Owen, the curator of the Royal College of Surgeons, who later became Superintendent of the British Museum (Natural History). Neither of the New Zealand discoveries with which Owen was most notably associated had any direct commercial significance. But in terms of scientific importance and excitement, there was little in New Zealand to equal them.

The first was the discovery and description of a series of giant, recently extinct New Zealand birds, the moas (Owen 1840, 1879). They were found and described by the missionaries William Williams, William Colenso, and Richard Taylor, and Walter Mantell, whose father, Gideon, was a contemporary of Owen. The Mantells were also involved in the second major discovery, that of the Takahe, or *Notornis,* thought to be extinct but found alive, although extremely rare. Aided by Owen's eminence in the power structure of British science, these men brought news of New Zealand's biota to the British public and in securing its enthusiasm helped set an imperial seal of ownership on colonial New Zealand's flora and fauna. Fossil material was ideal for this purpose. Although fossils had little economic value (see Table 1), they had great cultural significance. They were stable, easily transportable, and, in the case of the recently extinct moa, carried a sense of mystery and excitement.

The voyage of the *Acheron,* which arrived at Auckland in late 1848, was intended to fill in the gaps left by earlier natural history explorations and surveys: the last significant attempt to appropriate the biota by collecting, describing, and naming it. The voyage was only modestly successful, but by then the colony's own scientific infrastructure was starting to develop. Although the British succeeded in the colonization of New Zealand, why did colonial development not lead to more extensive and rapid publication in natural history? It has been argued that the cause lay in the British tradition. British science relied on underresourced individual genius or wealthy individuals (Banks is an example). The English were superb navigators, and the Banksian achievements were fully recognized in Europe (Merz 1897).

But there were a number of critics. Playfair in 1808 attacked the universities, and in 1830 Babbage wrote "... science [in England] does not constitute a distinct profession...." (Merz 1897:234). Even the Royal Botanic Gardens at Kew, which had done much to uphold British prestige in science, went into a decline after Banks' death. This decline was not reversed until one of the early breed of civil servant–scientists, W. J. Hooker, took over in 1841 (MacLeod 1974, 1999, Gascoigne 1998). Likewise, zoology at the British Museum suffered periodic declines until John Edward Gray took up the keepership of zoology in 1840 (Stearn 1981) and Richard Owen became the "British Cuvier" (Rupke 1994). Only later in the century, when channels of communication opened between the colonists and naturalists in London, did a more regular flow of scientific publications ensue.

How did specimens collected by British naturalists fare in relation to the pathways described in Table 1? Some, relatively few in the case of New Zealand species, became part of the knowledge base that allowed subsequent economic exploitation: flax, timber, and marine mammals, with some trade in rare bird skins and shells. Others were of greater cultural value, finding their way into private collections, art, and popular literature, as well as into scientific publications.

But the accumulation, description, and naming of natural history, even if interpreted as the appropriation of the biota and landscape, do not on their own secure colonies. Despite French attempts, it was Britain that took New Zealand as a colony. Beyond a certain point, once the curious, attractive, and commercially valuable species have been identified, there is a shift in balance in which national pride and scientific curiosity are increasingly invested in describing the rest of the biota, rather than in economic interest.

CONCLUSION

To return to the question asked at the beginning: It is evident that the three European traditions made different contributions to New Zealand natural history. Each evinced a different scientific style, which arguably can be traced to differences in domestic institutions and structures. It is clear that a strong presence at the accumulating (exploration) phase did not necessarily lead to scientific or economic control. Natural history served both utilitarian and cultural goals, the balance shifting as colonization proceeded. Although the discovery, accumulation, cataloging, and description of natural history was an important feature of colonization, there were elements of European discovery that had nothing to do with colonial expansion. On the contrary, as we have seen, French and German investigators, in particular, valued natural history in New Zealand principally for its scientific worth and for its contribution to international knowledge.

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