

## Special Issue

# Afterword: Hacking's *Glyptodon*

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Collecting in the field is a critical intersection between humans and the rest of the natural world. This afterword begins by suggesting what happens when practices of field collecting are downplayed or ignored, using Ian Hacking's discussion of the fossil *Glyptodon* in *Representing and Intervening* (1983). It then surveys collecting practices in the nineteenth and early twentieth centuries, focusing on questions of the colonial power in relation to the development of new roles and practices. During this key period, naturalists engaged with a remarkably diverse range of geographical sites, established traditions, and the challenges of imperial bureaucracies.

This article is part of a special issue entitled "Situated Nature," edited by Déborah Dubald and Catarina Madruga.

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**Keywords:** collecting; natural history; Glyptodon; go-betweens; Ian Hacking; science and empire

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When reading Ian Hacking's great book *Representing and Intervening* (1983) many years ago, I remember being struck by an uncharacteristic but serious mistake. The book offers a stimulating account of philosophy of science with a focus on experimenting, observing, and representing. It is rightly regarded as one of the works that brought philosophical sophistication to the renewed interest in practice in the history of science. An important chapter discusses what it means for something to "refer" to something in the sciences, and uses the example of *Glyptodon*:

If we are standing in the museum I may simply point to a largish and preposterously shaped skeleton. *That* is what I mean. In Frege's parlance, that very skeleton is the reference of my words, 'The glyptodon brought by Richard Owen from Buenos Aires.'

As not all museum visitors will know what the word "glyptodon" refers to, Hacking explains another aspect of reference:

I may tell you that a glyptodon is an enormous, extinct South American reptile akin to the armadillo, but with fluted teeth. With this definition I indicate what Frege would have called the *sense* of the word 'glyptodon'.<sup>1</sup>

There are problems with this, not least the awkward fact that *Glyptodon* and its modern armadillo relations are mammals, not reptiles. So as an example of reference this is not sense, as the German philosopher Gottlob Frege surely would have known, but nonsense.

The problem I want to focus on, however, is not about classification, but collecting. Richard Owen did not bring back *Glyptodon* from Buenos Aires, nor did he ever go there, nor is that where the relevant objects can be "discovered," which in a subsequent passage Hacking claims Owen did.<sup>2</sup> Although at first glance these are inconsequential slips, they deserve to be discussed in some detail, for they illustrate why the essays in this issue are significant for understanding the history of knowledge.

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<sup>1</sup> Hacking, *Representing*, 75–76.

<sup>2</sup> Hacking, *Representing*, 78.

Owen, as those familiar with paleontology will know, does have a role in the story, for his descriptive work on material from South America identified as fossil teeth led to a widely accepted description and a scientific classification that we use today. The surprising aspect of Hacking's account is that it collapses all the other actions that made *Glyptodon* an identifiable entity into these final procedures of naming, describing, and classifying. From this view, collecting is reduced to a mechanical act, akin to picking up a well-packed parcel and bringing it across the ocean. There is nothing about the difficulties: of identifying certain natural objects as potentially significant for science, of removing these materials from the ground, of protecting them from exposure, of bringing them to notice of interested parties, of relocating them to a place where they can be compared with other objects, and of preparing them for display. That one of the people who really was involved in sending specimens to London was Charles Darwin, who of course eventually became far more famous than Owen himself, just adds to the irony.

The mistake illustrates how influential commentators on science, even those so historically sensitive as Hacking, have ignored the work of collecting. Hacking is unusual among philosophers in stressing the need to view science as a process occurring in history, and he excoriates those who make up philosophical “just-so” stories. Yet in this case, even he fails to consider the significance of acts of seeing, finding, preserving, and distinguishing that make it possible to make sense of the remains of extinct animals, and to even understand them as such in the first place. Owen did not have all these skills, and even Darwin, who was learning them during the *Beagle* voyage, had to depend on others for knowing where potentially relevant objects might be.

The actual story of the construction of *Glyptodon* has been brilliantly recounted in an article by Irina Podgorny in the *British Journal for the History of Science*. Although Owen certainly did not “collect” *Glyptodon*, neither did Darwin, at least not in any straightforward way. Rather, the assemblage of something that was eventually named as a distinctive creature from the past involved extended interactions between a remarkable range of people. An important figure was the Uruguayan naturalist Dámaso Antonio Larrañaga, who displayed his collection to local visitors to his home in Montevideo and whose views were reported in European journals. Another was the traveler Friedrich Sellow who had been financed by the Prussian and Portuguese governments to collect specimens. Their findings of various fossilized remains were initially assimilated to *Megatherium*, a giant extinct sloth, as described by the Paris-based naturalist Georges Cuvier. At around the same time, the discovery of a living animal from the slopes of the Andes, termed by the locals *pichiciego* (pink fairy armadillo) encouraged this identification, as well as the idea that *Megatherium* might have been armored. More bones were eventually obtained, many of these gathered because of regimes of reporting information relevant to hygiene and “rubbish” enforced by local landowners. With considerable local and diplomatic help, Darwin then gathered further specimens on the *Beagle* voyage and sent them to London for identification by Owen. Owen's intervention mainly involved a new stress on the fluted structure of the teeth. As Podgorny concludes, “Owen created *Glyptodon* as a result of contingent findings, the superposition of different traditions of knowledge, and the confluence of commercial, diplomatic, scientific and philosophical transactions.”<sup>3</sup>

The story of *Glyptodon* matters for the same reason that the essays in this special issue matter. Collecting is a fundamental moment of encounter between humans and the rest of the natural world. The “field” is where different human knowledge practices collide, both with one another and with the ongoing processes of non-human worlds. Collecting can be for many purposes—gathering food, clearing debris, and assembling objects for ritual, entertainment, or healing. In many of the traditions discussed in these articles, the moment of collecting is when what Charles Darwin termed “the tangled bank” is disentangled into individual objects—specimens—for scientific display and study. Collecting in the field begins the process of defining “nature” as a subject for “science.” This is not so much a process of abstraction, as one of resituating.

Not least, the process of fragmentary assembly and partial knowledge involved in collecting makes the work of the relevant sciences messy, contingent, and irreducibly historical. Once we see the field as a vital place for science, it becomes much harder to maintain clear philosophical distinctions between experiment and observation, or between visible and invisible phenomena. Many objects of natural history are much more like electrons or quarks than is often thought to be the case—they are fragments that are visible in specific circumstances and for certain periods of time, so that relating them is not a straightforward matter of assembling pieces of a jigsaw. The differences involve the management of space—not only the field in

<sup>3</sup> Podgorny, “Fossil dealers,” 673.

relation to the laboratory or museum, but the spaces within the field and the spaces within laboratories or museums. Hacking rightly notices that the balance of characteristics used to identify a creature like *Glyptodon* has changed over time; but this is not just a question of interpretation or even of fresh evidence, but of highly interpretative, interactive, and often intrusive actions that we are only beginning to understand.

## Bureaucracies of Nature

The essays in this special issue offer a striking snapshot of the state of research into the practices of field collecting in botany, zoology, and geology. At first glance, their remarkable geographical range might be considered to contribute to a global history of knowledge-making. But that would be misleading, for this range of places and circumstances, although admirably broad, does not aim to be representative. Nor is being “representative” really an appropriate goal. A global history cannot be constructed from a series of specific cases, no matter how diverse. Adding Santiago, Nantes, and the Mary River to a list that traditionally includes London, Paris, and Berlin will not suddenly make an account “global” in any critical sense of the word.

What does give this group of essays unity is the question of colonial power in relation to the collecting of natural objects. All the essays focus on the era from the mid-nineteenth through the early twentieth centuries—primarily from the liberal revolutions of 1848 up to the commencement of the First World War. These pivotal decades witnessed the peak of the ambitions of the European nations towards controlling large parts of Asia, Africa, and other parts of the world. Even those parts that had earlier achieved independence (such as the republics of Latin America or regions previously under the control of the Austro-Hungarian empire), were tightly bound to informal networks of commerce and trade. They show how imperial control was maintained, extended, and contested—whether at a distance or in land-based polities.

The period of high empire represents a point when fantasies of a completely connected world reached their zenith.<sup>4</sup> The connections, often enabled by science, were seen increasingly as involving standardization, as in attempts to define uniform postal rates and the electrical units used in cable telegraphy. Among the most powerful standards were those applied to the natural world through processes of naming and description applied in zoology, botany, meteorology, oceanography, mineralogy, and stratigraphic geology. Notably, the half-century before the First World War is—as David Allen emphasized long ago—the “heyday” of natural history.<sup>5</sup> This is when the state began to intervene on a regular basis in the collection of botanical, zoological, and geological specimens, when large museums and botanic gardens became symbols of national wealth and imperial power. The formation of these institutions was accompanied by ever more rigorous procedures for what it meant to collect scientifically. In botany, for example, this meant defining exactly which parts of a plant to collect at what times; in mineralogy, it demanded certain specifications around specimen size and place of discovery.

The purpose of the procedures and institutions of collecting, however, was not to render the world uniform, but to highlight difference. Individual places, peoples, floras, and faunas were increasingly understood as highly distinctive. This is a period in which Europeans especially prized the exotic and the unusual. It is an age of stereotypes, a word that has a relevant double meaning both in terms of publishing technology and questions of identity. All the papers here show collecting being mobilized—often against resistance or sheer inertia—towards the elaboration of these universalizing standards. This meant not only that objects could be displayed and compared; it also allowed them to be traded between different places.

The colonial imperative led to attempts to create centralized bureaucracies with their attendant systems of surveillance and survey. Science, as the essays illustrate in a wide variety of ways, was at one level deeply tied to these systems, as what Daniel Headrick termed many years ago “tools of empire.”<sup>6</sup> In almost all the cases discussed here, the basic aim was to collect and move materials from peripheries (defined as “local”) to metropolitan centers. Almost always, this involved compromises. Collections were deeply shaped by local possibilities and priorities, but often by an exogenous activity that was fundamentally conditioned by huge disparities in resources and power. In these circumstances, defining “the field” involved claims over intellectual property. Who had the right to interpret the places in which people lived?

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<sup>4</sup> For these issues, see Osterhammel, *Transformation of the World*, and Rosenberg, *A World Connecting*.

<sup>5</sup> Allen, Review of Lynn Barber.

<sup>6</sup> Headrick, *Tools of Empire*.

In other ways, however, science was distanced from the more obvious—and violent—exercise of imperial power. Presented as neutral and objective, the pursuit of natural history highlighted the ideals of a “civilizing mission.” Western collectors could be presented to the peoples of colonized territories as agents of civilized advance, bringing knowledge into lands that were perceived to be lost in darkness. Light, in the form of displayed collections, botanical gardens, museum buildings, and reports about heroic naturalists, could be disseminated both in the capitals of empire and in colonial situations, or in places like Serbia struggling for national identity. In the latter case, the making of collections for educational purposes was an integral part of a wider program of defining the nation-state as a “natural” entity.

These bureaucratic structures and mechanisms of display defined the way in which individuals engaged in collecting. It is especially in the context of developing imperial bureaucracies that scientific careers began to flourish, especially given the insatiable demand of metropolitan museums for diverse specimens in quantity. In that sense, empire provided the settings, within a variety of European traditions, for defining the role of a “naturalist.” These differing arrangements highlight distinctions between those who worked for government surveys as imperial agents, and those who were present in a private capacity or as paid collectors.

It is no accident that many of the essays in this special issue focus on key individuals in relation to these roles. Even in the increasingly bureaucratized worlds of late nineteenth-century imperial endeavor, in any given locality there were not that many whose primary identity was that of naturalist; and the number of practitioners was limited compared with other available roles. Many of the associated roles were related to the traditional professions such as surgeon, soldier, or priest, which demanded relatively well-established forms of knowledge and skill. Others were farmers, hunters, quarry workers, or others engaged in resource extraction. Still others had occupations related to older forms of interaction with outsiders, such as traders, merchants, or expert guides to the local territory. Within all these groups, one could be a “professed naturalist,” and even be paid for the work; but the structures supporting knowledge-making were too weak to define natural history as a clearly demarcated profession. Instead, a more nuanced typology of roles for collectors is emerging, certainly more useful than the simplistic divisions between “professional” and “amateur.”

## The Ambiguities of Knowledge

The essays brought together here trace the encounters between individual naturalists and a remarkable array of other people possessing different forms of knowledge. In recovering the fine detail of these interactions there are inevitably problems with the availability of evidence, as is so often the case when vibrant oral cultures engage with those that depend upon print. These differences in communication modes are fundamental to the asymmetry of power involved in the production of knowledge. Historians can read against the grain of printed texts, use material evidence, and find other ways around the problem—as indeed work on women, working people, and other often marginalized groups has done for the past fifty years—but in the end, a fully rounded account of the encounters involved in collecting is often simply impossible.

The reasons for this have not just to do with a paucity of evidence, but also with asymmetries in perspective. Collecting for scientific purposes in the long nineteenth century was an activity that for the most part depended on initiatives that ultimately derived from authorities located in Europe.<sup>7</sup> The silences of the archive are not just the general ones pertaining to different attitudes towards the preservation of oral versus written testimony but are inherent in the processes of natural history itself and the purposes for which it was designed. For entirely understandable reasons, the natural history enterprises of colonizers continue to provide the primary frame for understanding what collecting is fundamentally about. Collecting, viewed as a scientific enterprise, ultimately feeds back to typically Western practices of naming, describing, publishing, and displaying in organized arrays of natural objects.

The asymmetries appear less severe when the aims of scientific collecting interact with those of agents whose commitments substantially overlap. Figures like the naturalist Claude Gay could move between the very different scientific communities of France and Chile, in large part because of shared expectations and ideals—even if they were often difficult to achieve amidst political and economic instability. Another example in the present collection involves studies of the underground structure of the Lower-Loire in France,

<sup>7</sup> Of course, highly centralized initiatives have had their own problems of preservation, as decades of work could be wiped out by a single fire or flood—as in the case of the catastrophic fire that destroyed the nineteenth-century Lisbon zoological collections.

where similar systems of recording were often employed both by mining engineers and geologists working for the government survey. In the end, the characteristics of “the field” were determined in encounters that crossed between the spaces of office desks, museums, quarries and mines—with the final determination made within a hierarchical structure of state bureaucracy.

Indigenous peoples in territories remote from metropolitan centers could be encouraged to contribute to the collecting enterprise, thereby engaging very different forms of knowledge in collaboration. Many individuals named in these essays fit very well the category of “go-betweens.”<sup>8</sup> These are exceptional individuals who moved between two or more different cultures, able to translate knowledge from one setting into another. In a recent essay, Jan de Vries identified them as “‘unusually cosmopolitan individuals’ (UCIs) who led global lives.”<sup>9</sup> Although bringing their contributions to light is undoubtedly valuable, this is only a first step in thinking through the colonial encounter. The danger can be that the available evidence means that only those specific intermediaries who were contributing to the European enterprise are highlighted, in what Felix Driver has termed “salvage biography.”<sup>10</sup>

All of these essays go beyond the biographical in important ways, but the clearest challenge to this focus is the account of the trementinaires, or turpentine collectors, in the High Pyrenees on the Iberian Peninsula. This essay examines women who collected and sold herbal medicines as part of a subsistence economy, using knowledge of plants handed down through oral tradition rather than publication or formal education. Their relation to masculine, elite science was one of opposition. In the end, these activities were marginalized, being seen as “sorcery” and “superstition” rather than as part of a history of botany focused on systems of universal classification. For that reason, the essay does not aim to show that expert male botanists incorporated the knowledge of the trementinaires into their museums, publications and medical remedies. I suspect that this lack of exchange is not all that unusual given that the power relations between colonized and colonizers were often so unequal, and their views of nature so different. It could be argued that contact, far from regularizing the exchange of different forms of knowledge, more usually led to the forced silencing of alternatives. Such an analysis becomes difficult to deny when cultural contact is viewed over the very long term. Inside the velvet glove of the “civilizing mission” was an iron fist of epistemological violence.

At the same time, it is easy to forget that the colonizers had their own internal conflicts. These insecurities took many forms. Support for science was often patchy, uncertain, and could be withdrawn at the whim of a new administration or in the face of changed economic circumstances. Many European collectors were marginal to the core military, strategic, and economic purposes of colonial control; their positions were often combined with other activities and involved moral imperatives at odds with those in authority. This is apparent in the range of people employed by José Vicente Barbosa du Bocage to collect on behalf of the natural history museum in Lisbon, including some who were actively critical of the regime. In many circumstances, the quest for control reached its limits, as in the case of the Australian lungfish. This spectacularly anomalous creature “moved between pond and plate through social networks into museum collections,” while simultaneously subverting the heroic egotism inherent in the collecting enterprise. Others, like the English traveler Margaret Fountaine, traversed the globe using independent financial resources. Her articles and other public writings employ the standard tropes of conquest and adventure; but her private diaries record doubts and uncertainty, especially given the need to kill insects, the very things she loved most, in the act of collecting that was essential to her very identity. This internal tension between violence and science, as expressed in the act of collecting, is emblematic of more general anxieties about the place of knowledge in imperial conquest.

## Concluding Thoughts

The studies in this special issue draw upon a much deeper picture than previously available of the wider settings for the making of knowledge in the nineteenth century. The changing nature of careers is more subtly understood, with older models of “amateur” and “professional” giving way to a nuanced sense of vocation, commitment, and opportunity. The shifting balance between governments, commerce, and individual initiative is also better appreciated, and in a wider variety of settings. Most significantly, our accounts of knowledge production are being transformed by an examination of contexts beyond Europe,

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<sup>8</sup> Schaffer et al., *Brokered World*.

<sup>9</sup> De Vries, “Playing with Scales,” 28.

<sup>10</sup> Driver, “Intermediaries and the Archive of Exploration.”

which no longer always means the urban centers of northwestern Europe. This has provided a new picture, exposing the limitations of an account of so-called global science that takes overseas empires—especially those of Britain and France—as their primary model.

Taken together, these essays offer a roadmap for future explorations of natural history collecting practices and their relation to defining sites in nature as the “field.” As the editors have suggested in the introduction, this will require a focus on material objects, a direct sense of embodiment, and a full understanding of relevant skills of preparation, identification, observation, and display. It will involve highlighting the sensory aspects of natural history, not only sight but also taste, smell, hearing, and touch. It will necessitate extending the existing collaborations between museum curators, conservationists, librarians, and academic historians. It will mean searching for evidence of instrumentation—for nets, pins, boxes, hammers, goggles, tweezers, and microscopes. In certain circumstances, it can involve experiencing the original sites of scientific work firsthand.<sup>11</sup> Perhaps above all, understanding the knowledge practices of natural history requires looking closely at the physical qualities of preserved objects, ranging from fossilized bones, animal skins, and pressed plants to annotated books, letters, and other records of human testimony. An admirable feature of Hacking’s account of his reptilian *Glyptodon* is that it begins with a specific specimen in a museum. Such material objects can provide a starting point for understanding the coordinated movements of eye, mind, and hand involved in producing knowledge; they are traces of encounters that have shaped conceptions of nature and the meanings of the field.

### Competing interests (if applicable)

The author has no competing interests to declare.

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<sup>11</sup> See Martin J. S. Rudwick, “On ‘Re-Treading’ Early Geological Fieldwork.”