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Charming Worms

Crawling Between Natures

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Some anthropologists have argued that Euro-American culture is naturalist, anchored to the belief in a coherent, unitary universe in which natural laws operate. From a close ethnographic inspection, however, the allegedly naturalist sciences emerge as heterogeneous practices, engaging with complex and not quite coherent objects. Following one such object – an earthworm – allows me to show that the earthworm science that studies it has no univocal object, but rather one that is multiple. At the same time, scientists successfully engage in practices that seek to hold together the incoherent earthworm/s and the world/s in which it is/they are being practised. It is in this way that coherence may still be achieved. Exploring the gaps between multiple ontologies and coordinating practices allows for the emergence of a sharper, practice-attentive understanding of science and its naturalist achievements. If it is true that a single, unitary Nature is nowhere to be found, the analysis presented here shows how a transient, contingent, multiple, and – yet – still bound-together nature may result from careful coordination practices.

Keywords: naturalism, multiplicity, practices, science studies, coherence, nature

Introduction: *Counting Natures*

We staunchly believe that science must in the end be unified, because it tries to tell the truth about the world, and there is surely only one world.

(What a strange statement, as if we had tried counting worlds.)

(Hacking 1992: 57)

With these ironic words on the unity of science, Ian Hacking opened up the space to ask an unusual question: how many worlds or, rather, natures are there? While anthropologists have long been interested in the ways in which other cultures relate to nature and how they imagine it (Dove and Carpenter 2008), only recently has ethnographic curiosity begun questioning the ontological unity of nature in other cosmological systems. This effort, solidly grounded in ethnographic methods, has proved to be particularly productive for anthropology as a whole, as the many publications on this theme demonstrate (cf. amongst others, Viveiros de Castro 1998; Kohn 2007; Pedersen, Empson and Humphrey 2007; Jensen 2011). However, these works have often employed the category of ‘the West’ as an oppositional counterpart

to alternative ontologies, refraining from exploring it ethnographically. The work of Philippe Descola (2006) is a symptomatic – though unconventional – example of this.¹ Where other scholars carefully attend to their ethnographic material, offering a less static, less crystalline picture of what ontologies can be made to be, Descola fixes these shades in grandiose structures. For him, ‘Western culture’ is *naturalist* as it is informed by the belief in ‘the coexistence between a single unifying nature and a multiplicity of cultures’ (Descola 2009: 153). Still, this characterization of ‘Western thought’ lightly skips over its intricacies. ‘I will not dwell on the definition of naturalism, so familiar to us is the state of the world that it qualifies,’ writes Descola (ibid: 152), relinquishing the task of charting naturalism ethnographically. This begs for more work on what is assumed to be familiar. How then to investigate ‘Western naturalism’ empirically and ethnographically?

Anthropologists will recall that Science and Technology Studies (STS) did not just engage in ethnographies ‘at home’ but did so, more specifically, in the very labs where scientists were at work studying ‘nature’ (cf. for example, Latour and Woolgar 1979; Biagioli 1999).² After studying life in the laboratory, STS scholars also moved outside the lab, to explore other sites where science is at work, opening up a variety of knowledge practices. They explored specific, situated moments, shifting from the analysis of what Science says, from its ‘thoughts’, to how sciences are being done (Latour 1987). In these practices they attended to the ‘doings’ of everyone and everything around, without categorizing *a priori* the possible ‘actors’. As they followed the networks that emerged from practices, the actors began to proliferate. Where homogeneity was expected, they found heterogeneity. Science, they suggested, is made out of heterogeneous entities. These are not simple but complex, not neat but a ‘mess’ (Law 2002). Rather than pure, they are ‘hybrids’ and ‘imbroglios’ of all kinds of objects and subjects (Latour 1993). And since practices engage the world in different ways, their objects, even if they go by a single name, come in different versions (Mol 1999). The objects that sciences study, then, multiply. What these objects are – their ontology – is no longer given before the research starts, and neither does it simply depend on the epistemological lens used to study them. Instead, it is shaped by how they are *done*, by how they emerge from practices. Mol (2002a, 2002b) has shown how in an ordinary Dutch hospital bodies with atherosclerosis are done in different ways and thus emerge as multiple. Coordinating between them so as to treat ‘a patient’ is considerable work. But if the objects of science in labs and clinics multiply with the practices in which they are being done, then ‘nature’ also becomes more than one. However, all the coordination that binds it together makes one wonder if, still, it is ‘many’.³

So we are taken back to our initial question. How many natures are there? In what follows I want to address this question. But this is no easy task: *where* and *when* to count natures? And *what* natures? I start, in the manner of STS, by considering a single, situated, object of scientific practices: earthworms.⁴ They had a significant role in the development of Western science, having figured in the studies of many key thinkers in biology (e.g., von Uexküll 2010). Darwin even dedicated the last thirty years of his life to these creatures, and explored their importance for the soil ecosystem. Among other things, he argued that they ‘prepare the ground in an excellent manner for the growth of fibrous-rooted plants and for seedlings of all kinds’ (1881: 309).

Following the lead of Darwin, a group of scientists recently founded the Earthworm Society of Britain (ESB), where I conducted the ethnographic research for this article. This society is interested in the ecological impact of earthworms and ‘aims to promote and support scientific research so that earthworms and their environment can be better understood’. The members of the ESB organize a number of activities concerned with earthworms in the U.K. The initiative came mainly from members of the Soil Biodiversity Group of the Entomology Department of the London Natural History Museum (NHM), and most of these activities revolve around the museum; ‘a true Temple of Nature’, as *The Times* called the museum on its inauguration in 1881.

Following some of the practices that take place in and around this cathedral of ‘Western naturalism’, *what an earthworm is* becomes a fascinating question, as different earthworms appear to emerge from different research practices. Thus, the earthworm multiplies and nature multiplies along with it. But while this offers us a way to attend to the multiplicity of natures in ‘Western science’, it also makes it possible for us to consider the various ways in which nature is made to cohere. In the process, the unitary Nature of naturalism emerges neither as a given, nor as a ‘belief’ of ‘the West’, but rather as something that is achieved, and that is achieved in various ways at that. Simultaneously, the very notion of ‘the West’ is itself recast. ‘The West’ is not given, stable and self-evident, but a temporary, situated and multiple achievement. Asking how many natures there are, then, becomes a question without an answer – a question that is, even so, highly productive, as it shifts the assumption that ‘we know’ naturalism to an exploration of what is being done in science-related practices. This move is crucial in shaking up the ‘familiarity’ of the realities we live by, a key aspect of anthropology. Thus, in the unsettling of what ‘we know’, ‘Western naturalism’ emerges as an interesting object for ethnographic fieldwork. Let us now return to the earthworm in the Natural History Museum.

Worms in Jars

Emma Sherlock is the President of the ESB and the Curator of the Lower Invertebrate section at the NHM. As the NHM website explains:

Once the specimens have arrived at the Museum, they need to be prepared and labelled by curators, ready for identification. But the majority of a curator’s time is spent maintaining and documenting the Museum’s existing collections. Many of the specimens are fragile and need to be handled as little as possible, whereas others are unstable and sensitive to changing light and moisture conditions. There is also the problem of attack from insects, mould and rodents. Curators work vigilantly to protect against all these symptoms and foes, while continually gathering new information about the specimens and making this information available to the world.⁵

As a curator, Emma is concerned with the collection, preservation, identification and conservation of natural specimens. When I meet her in her office she shows me some jars on her desk:

Fortuitously I have on my desk some nice worms ... because I took them into a school the other day. ... This is the giant Australian earthworm, *Megascolides australis* ... And

these ones I've collected myself, so I'm particularly proud of them. These are from the Carpathian mountains. And I really love the way you can then just show the different features. You can show the way it can pull up the prostomium and see how the mouth opens and things... and you can see the setae really nicely. It's a really good learning tool for the kids.

These are the worms Emma works with. Her earthworms are of a particular kind: they are dead. Because of their physiology, dead earthworms usually last for a very short time; their bodies take less than a week to be completely decomposed by microorganisms and moulds. Like all the specimens in natural history collections, they have a particular 'kind of recalcitrance: they must be preserved against decay' (Star and Griesemer 1989: 402). To achieve this preservation, Emma's worms need to be prepared in a specific way (Figure 1). At the moment of their collection, they are usually anesthetized in 30 per cent alcohol before being straightened out and killed in 96 per cent alcohol. Finally, their bodies, fixed in formalin, are placed in 80 per cent Industrial Methylated Spirits in the jars of the Annelids collections.

However, avoiding the worms' rapid decay is not the only reason to preserve them. As Emma tells me: 'I'm responsible for looking after all the Annelids collections and

Figure 1: Some preserved specimens of earthworms and other invertebrates in Emma's lab in the NHM. (Photo taken by the author)

I'm also looking after the Sponge collections and basically all the free living worms. ... So I'm doing quite a lot of label writing.' Her job consists of more than just preserving the specimens: she also identifies them and writes their labels. To do so, she relies on her taxonomical expertise. As a colleague of hers explained to me, 'Emma has done a lot, in fact the majority, of the identification work for the project that I am involved in. ... She is very modest, but her expertise in earthworm taxonomy is very good.' It was Emma who wrote the earthworm identification key for Britain and Ireland published by the Field Studies Council in the 'Aids to Identification in Difficult Groups of Animals and Plants (AIDGAP)' series (Sherlock 2011).

Considering some of the bodily features of the earthworm allows her to identify the species. The first step, as the AIDGAP key points out, is to learn how to count the segments in which the worm's body is divided:

This is something you will have to do a lot. To get started the first segment to count is the first full ring. Do not count the prostomium. ... Some segments can have confusing furrows through them, if unsure look for the setae ridges to count segments. ... Look carefully when counting. (ibid.: 3)

Once this is learned, it is important to find out whether the head is tanylobic or epilobic, that is, whether the lines that characterize the mouth (prostomium) meet the second segment or not: 'Often this will involve manipulating the worm to get it in a suitable position. Do not be too scared to hold the head down with forceps to get a good view' (ibid.: 2). After this, other features need to be examined. For example, the positions of the male pores, the clitellum, the tubercular pubertatis (TP, marks 'that are to be found on the lateral undersides of the clitellum') and the setae all help in identifying the worm. To recognize these features, the worm needs to be very steady, so the identification key requires 'the worms to have been preserved [and] completely submerged in a petri dish in alcohol or water' (ibid.: 1).

The worms need to be prepared in alcohol for identification. Once they are in jars, Emma can work with earthworms: she can bring them to the lab, put them in a petri dish, observe them under the microscope and put them back into the collection. Their features are discernible under the microscope and resist decay. The next question is how to store and how to keep them over long periods of time. This is not easy and the NHM has had to develop facilities for the purpose. The NHM is home to one of the largest natural history collections, and a majority of the over 29 million specimens is housed in the 22,000 square meters of the Darwin Centre in South Kensington. Rooms with lines of cupboards hold millions of jars at a constant temperature of 13°C to prevent the specimens from decaying. This set-up not only allows for their preservation, it also enables scientists to look at them again and again under the entomological microscope.

Similar techniques and technologies also allow worms to travel around the world to reach the NHM. The specimens Emma identifies come from all over the world, and often include new species. 'One of my major projects here is the unidentified collections. And you can see some gaps where I managed to put some in their place. But I still have to try to identify most of these. And there will be many new species in this cupboard alone,' Emma tells me while standing in front of a line of cupboards with shelves filled with piles of jars with few and incomplete labels. When a new species is

found, the specimen from which the species description has been written becomes a type specimen. 'Anything with a bit of red paint is a type specimen, so they are the first ones used in species description. We are lucky enough to have, I think the biggest type collection in the world, here,' Emma explains. The types are the worms that will be used in all future reference work for that species.

However, identification not only involves the specimen, but also relates it to its context. A specimen with no geographical and no chronological information is useless to research. Thus, Emma's work does not stop at the morphological level. For every specimen, she needs to pin-point the provenance and the date it was collected. 'This is where I need to go through archives. And actually I have a session booked all day on Wednesday, just to go through the Annelids archives. It is stuff like this that I need to try to find out, because over the years the paperwork is not always there, so ... I'm just trying to track everything back.' All these aspects of an earthworm specimen are made explicit in the label that accompanies the jar in which the preserved body is kept.

To summarize: the worms Emma works with in the museum are dead worms, their environments are written environments. They are worms stored in a jar like pickled vegetables, to preserve them from decay, marked with a label that tells where they come from.

Worms on Maps

Dr Daniel Carpenter is another member of the ESB and he works in the Soil Biodiversity Group of the NHM. When I was asking him about the society, he told me:

We got a grant from an organization called OPAL [Open Air Laboratories], which is based here at the museum. They are trying to encourage members of the public to get involved in natural history. ... So they gave us a grant to set up the earthworm society. It is something that we've been talking about for a couple of years, but this was just the impetus we needed to set up and get going, basically.

Their aim was 'to try to encourage the public into helping us map earthworms in the U.K.' Eventually, as the ESB website states, 'one of the main priorities of the ESB is to host a recording scheme for British earthworms'⁶

As the recording scheme progresses, the results are added to the map on the OPAL Soil and Earthworm survey webpage: an 'earthworm distribution map', to be precise. On the right-hand side of the map, tick-boxes allow the visitors of the website to select which of the thirteen kinds of earthworms (twelve species, one of which has two varieties) to show on the map. There is also a box for the unknown specimens. As the different species are selected, dots of different colours appear on the map. In just a few years, the survey has already collected twice as many records as those collected by professionals over almost a century. The earthworms recorded by the survey are not preserved and labelled. Instead, they are dots on a map.

But how do these dots get there? To gather new data, Dr Carpenter and his ESB colleagues enrol members of the public. Only in this way may they hope to succeed in their effort to map earthworm distribution. The recording scheme is structured as a survey that will mobilize people, with a special focus on school children and

is simplified. Of twenty-six British earthworms species, only twelve (one of which presents two varieties, which are included in the list separately) are included in the identification chart and on the survey results. Earlier research has suggested that these twelve are the most widespread. Each of these species is identified by a common name, rather than by their scientific name (which is, however, included in the workbook).

In this record sheet, the earthworms are not yet dots, but rather crosses entered on a checklist following the guidelines of workbook and field guide. Thus, the survey affords amateurs the handling of the worms. These worms, in their turn, emerge as numbers from 1 to 13: the thirteen most common species of Britain. The worms are also crosses and numbers in other fields of the table: their length, their colour, the place in which they were found, and a number of features of the earth from which they were collected. The workbook and the OPAL website call the sum of all these crosses 'results'. Then, from the form on the workbook, the results are copied to an online form, to be immediately fed into a map of the United Kingdom and to become dots.

But, what happens once the dots are on the map? With almost 9,000 dots of different colours spread throughout the U.K., the distribution map is not very accessible. It still does not provide any easy-to-use information on the distribution of the worms. To make it relevant to other scientists, Dr Carpenter and his colleagues need to transform the earthworms yet again. In a recent publication, Dan, Emma and a few of their colleagues used the existing earthworm records from the U.K. to produce a preliminary map of the worms' distribution (Carpenter et al. 2011). In the article, they state that 'we know relatively little about earthworm distribution and to date no distribution maps have been produced for the British Isles at the species level' (ibid.: 476). Even though they provide a tentative map which highlights some trends, they write: 'What is obvious from the map of earthworm records to date is the paucity of data. Currently records are at best patchy, with large areas of the British Isles having no records at all' (ibid.: 480). The interest of the scientific audience of Dr Carpenter is in data – the lack of it is at the heart of the efforts of the ESB. As Dan told me:

The main thing we are interested in doing is recording earthworm distribution, getting people to sample earthworms and then send us their identification so that we can produce maps. ... Even now we don't have a good idea of how all the species you find in the U.K. are distributed. We've got about three thousand records, which is not very many. They don't even cover the whole of the U.K. The hope is that we can start filling the blanks in the map.

Filling the blanks on the map is the main reason why the ESB was initiated. In their article, Dan, Emma and their colleagues write:

In order to address the current under-recording of earthworms in the UK a recording scheme has been set up, administered by the Earthworm Society of Britain (ESB), with the data managed by the BRC [Biological Records Centre]. The data will be available on the ESB website as well as through the National Biodiversity Network website (<http://www.nbn.org.uk/>). It is hoped that by collating existing databases of earthworm records from museums and research collections and by training new earthworm recorders, our understanding of earthworm distribution in the UK will be significantly enhanced. (ibid.: 484)

In their article, the earthworms become distribution data. This is what the ESB, Imperial College and OPAL are gathering: the results of the survey, transformed into data to contribute to a more extended and articulated database on earthworms in the U.K. These data are very significant to scientists. As Dan, Emma and colleagues write:

Distribution data provide a baseline from which to monitor changes in species ranges. Climate change, land use change and habitat disturbance and fragmentation can all have significant impacts on the distribution of species at different scales ... Distribution data also allow strategic decisions to be made on conservation focus and effort. As such, distribution data allow us to monitor responses to environmental change and to develop mitigation or remediation strategies. (ibid.: 476)

Here the earthworms are turned into baseline data for studies into a range of issues. They are proxies for understanding climate change, land use change, habitat disturbance and for the implementation of conservation, mitigation and remediation strategies. The earthworms are thus made relevant for the scientific community, for the lay public and for funding agencies.

To summarize: the earthworms recorded by the survey shift from being crosses in tick-boxes, to being dots on maps, to being data for scientific articles about climate change or mitigation and remediation strategies. These transformations allow the earthworms to move from one site to the other, become relevant in different ways and take on different material configurations.

Many Worms, Many Natures

In following the practices of the ESB, we saw that 'what an earthworm is' varies from one instance to another. The point is not one of disagreement between people; it is one of discordance between practices. The people involved in these practices would agree that we are talking about worms in all cases. Yet different earthworms emerge from different practices: they are done differently. One earthworm is a dead, preserved worm, a worm that has been anaesthetized, killed in formalin and stored in a glass jar with methylated spirits. Another is a dot on a map, the results from the filling of forms that are made to move in different spaces, on which people have put crosses in tick-boxes, and that may then travel under the name of distribution data. These worms do not exist in isolation, but emerge together with a number of other objects and in specific practices. While the first one could not be there without jars, formalin, methylated spirits and the NHM, the second needs the OPAL foldout guide, the survey map and the scientific article. They are not there *before* the practices in which they are involved, but come into being *in* and *through* those practices.

Without someone *preserving* it, the worm would not be a specimen in a museum. This is achieved through the work of Emma and many others. The worm also needs *mapping* to become a dot on a map, and it needs even more work to be turned into data and mobilized – when talking of climate change, for example. Once again, this is something that is accomplished, not a fact of nature.

Let me expand this point, since it is a crucial one. If we do not rely on predetermined notions, like what an earthworm is, but focus instead on what happens, on what is

done, different assemblages of entities and relations emerge as different *enactments* of worms. This focus on practices multiplies and fluidifies ontology. Simultaneously, it materializes semiotics. Thus, there is no longer a clear-cut distinction between representations and their objects and vice versa, since they both engender specific practices that allow for different situations, outcomes, and entities to emerge. Ontology, then, is no longer a substantial essence of clearly delimited entities that is static and given. Instead, it is variously redefined by the effects and outcomes of entities and their relational assemblages, as they come together in situated, multiple events. Ontologies are not about *what things are*, but *what they do* and *how they do it*. The different worms we encountered in the practices of the ESB are *not* different *understandings* or different *kinds* of the same worm. They are *different worms*, enacted in different ways that afford them to do different things. They do not emerge (only) from the scientists' words, but from their practices.⁸

Since these worms are being done in practices, then the nature they are part of and stand for is also being done in these practices. Considering different versions of earthworms, then, can help us in our task of counting natures in 'Western naturalism'. From what we have seen so far, it is evident that there must be more than one. In much the same way as the different worms, the natures that come with the worms are not different understandings of nature, but *different ways of doing nature*.

Let's start with the dead worms again and consider which natures they enact. The nature that emerges from the practices of curators in natural history museums who handle preserved specimens is a preserved nature. It is a nature to be protected against rot, decay, extinction, disappearance, change. A nature set against time, against decay. It is a nature that requires preservation, in need of cataloguing, in order not to fade away without trace. As the colours of the wet specimens will change and some other features will disappear, a number of preservation techniques are used, from photography, to taxidermy, to art, tissue cultures and DNA data banks. Nature is hard to preserve, but it allows it, if the right kind of effort is made. The nature we can find in a natural history collection is dead, but still going strong. Museums of natural history indeed display an *historical* nature, orderly showcased and made eternal by fixing and preserving it.

The worms that are dots resulting from crosses and used as data carry a different nature with them, a nature distributed in space and in need of mapping. However, it is not fixed: it changes and is therefore in need of constant mapping and monitoring. Still, a temporarily stable ordering can be achieved, and this is what the ESB tries to work on. For only if this nature is properly mapped, is it possible to manage it. *Mapped* and *monitored*, nature may yet become manageable. Or such is the hope invested in these modes of doing worms.

Following the practices of the ESB, we have been able to count two different genres of nature; two natures. These are done in the respective practices of preserving worms, and placing them on maps. Neither of them is given 'out there'. They come with practices. At the same time, the ESB itself suggests in its statements and in the way its website is organized that there is a Nature 'out there'. All the people involved in the society and its projects would agree that there is an earthworm 'out there'. This agreed-upon nature 'out there' is the naturalist Nature that Descola presumes we are *all familiar with*. Where does that come from? How can it be that we are all familiar with a singular

Nature 'out there' while our practices concern themselves with diverse natures? How are different natures made to cohere?

Coordination Techniques

Here we arrive at the heart of the argument. To make different versions of nature cohere, they need to be properly coordinated. The naturalist Nature is achieved through such coordination. 'Western naturalists' are not naturalist because they 'believe' in one, unified Nature, (pace Descola) but because they *order natures* into a plurality and effectively achieve one Nature by policing the relations between such plural natures. 'Euro-American' scientists are 'naturalist' due to the facilities that allow them to move easily through differences. The 'strength' of 'Western naturalist science', thus, lies not so much in its unitary Nature, but rather in its agility in foregrounding and backgrounding its coordination practices.⁹ This agility has often been articulated along a number of axes and coordinates, like scales and domains, time and space.¹⁰ While these coordinates have been variously explored, here we are interested in the specific coordination techniques that emerge from the practices of the ESB. In this sense, the coexistence of multiple natures and various practices that make them cohere in more unitary ways is always specific and situated. The purification and hybridization that Latour (1993) insists on in this context are coordination techniques for sure – but there are many more. The activities involved in coordinating natures are not first and foremost mental (as in cognitively separating a non-human nature from a human culture), but they are about practical, makeshift arrangements. Coordination techniques are concrete practices that order and arrange natures together. How does this work in the case of the earthworms we have dug out earlier? Where do these earthworms meet and how are they kept together?

The first site in which different earthworms come together is the museum. As Kevin Hetherington suggests: 'What the museum tries to achieve is some form of homogeneous order. Such homogeneity may be organized through classificatory, aesthetic, narrative and auratic means' (1999: 51). Connecting this ordering attitude to its display and representation is a traditional move in social sciences' understandings of museums.¹¹ Yet what happens in the wet collections of the NHM is not so much about display as it is about storage and classification. In this sense, the worms preserved in jars are the enactment of a specific form of order, one that makes certain differences more relevant than others. This is apparent in those jars that have a bit of red paint. These contain the 'type specimens', those 'used in species description', as Emma told me. These worms are more important than others. They are used for all future reference work. Their characteristics are the object of the collection. They are the ones that originated the taxonomical classification. Shifting from a dead worm to a morphological description, to a scientific nomenclature, these worms create the taxonomical ground on which heterogeneous things can be suddenly more homogeneous. Using type specimens is a *coordination technique*. Through them a feature of a species, or a set of features, is made more relevant than others, consolidated and allowed to move through a number of heterogeneous entities. While they stabilize certain characteristics of a species, they allow the different worms we encountered to be kept the same. They make one

similarity, the taxonomic group *Annelida*, more important and stable, and thus capable of referring to all the different worms.¹²

In this way, multiple versions of the worm are kept together, and natures done, in the museum. By turning the dead worm into a type specimen, the latter becomes capable of including and overriding the differences between the worm dug out of the soil, the image of the identification key, the description of the worms that the fold-out guide offers, the tick-box in the results table in the survey, or the dot on the map that refers to that box. Their materialities are different: one is a dead worm in alcohol, another is a crawling earthworm, a third is a microscope photograph of a part of a worm body, a fourth is a print-out, glossy description, a fifth is a square on a table, and a sixth is a number of bits showing up as a dot on a map. Yet they all are one of the twelve most common earthworm species in Britain in the Soil and Earthworm survey. They are specimens of a species.

Another instance in which different worms come together is the scientific article. Classical STS literature has analysed these coordination techniques. Articles rely on what Latour and Woolgar call 'inscription devices': 'any item of apparatus or particular configuration of such items which can transform a material substance into a figure or a diagram' (1979: 51). From the heterogeneity of materials, the articles work on more homogenous figures, data, diagrams, maps and references to create a coherent assemblage of different things. In one of their articles, Dan Carpenter, Emma Sherlock and their colleagues (Carpenter et al. 2011) allow different worms to come together. In their article they enact these worms in a linear and causal process. First, they foreground the species and their locations, the same ones coordinated by type specimens, dead worms in museum collections and identification keys, as they make clear in their Methods section: 'First, the British earthworm collection at the Natural History Museum, London, was surveyed and locality data from specimen labels was obtained' (ibid.: 476). From the dead worm, they then move to the one that is dug out: to collect information about the distribution of the worms, they formed the ESB to organize a training campaign mobilizing amateurs to gather more data on earthworm distribution by 'charming' them out of the soil: 'It is hoped that by collating existing databases of earthworm records from museums and research collections and by training new earthworm recorders, our understanding of earthworm distribution in the UK will be significantly enhanced' (ibid.: 484). The training campaign, as made explicit in the quote above, will then produce the worm as a dot on a map, and as distribution data. The linearity of this process allows a similar kind of coordination as the one afforded by the type specimens. The article brings together different worms, but also different ways of making them coherent. Foregrounding this process affords the ESB to map the worms. Besides, by foregrounding the process of the mapping work, indications can be offered, or suggestions made to improve the mapping of earthworm distribution. The article, as a coordination technique, *relies on* and *generates* other such practices and facilities – for example, the linearity that affords species descriptions and type specimens from worms previously dug out.

Often these practices are hidden and disappear from sight, allowing scientists to merge many natures in one whole, grandiose Nature 'out there'. At the same time, this also admits space for the multiplicity that can be seen in practices, but only in so far as

these differences are regulated and made to follow 'appropriate ground rules' that are 'put in place to regulate their relations and secure their independence' (Law 2004: 162). This permits scientists to create ordered plurality – which is usually understood as a diversity of perspectives on one Nature – from multiplicity, which is the messier and simultaneous coexistence of (ontological) differences in practices.¹³ The ground rules that make this shift from multiplicity to plurality possible are not constant or universal. Rather, they change with changes in the notion of coherence and the transformations in techniques for offering 'faithful representations'. Different ontologies are thus organized and related as different representations of one unitary ontology. This shift is, I argue, the condition of possibility of a unified Nature. Coordination techniques make this possible. At this point it is clear that asking how many natures there are can elicit no single answer. Not only have we found at least two different worms and natures, but also at least two ways of doing coherence between them; coordinating them differently.

Conclusions: Naturalisms and Wests

We began this article wondering how many natures there were, but, as soon as we started looking for an answer, natures began to multiply like a Lernaean Hydra, and we lost count. Such a question, we discovered, has no answer. Hacking was right: counting natures is really an impossible task. But a relevant one, nevertheless: it reminds us that having one, unitary Nature is an achievement and not a natural fact. Naturalism is not 'the belief that nature does exist, that certain things owe their existence and development to a principle extraneous both to chance and to the effects of human will' (Descola 1996: 88). In fact, if we consider practices, it could be described as the ongoing accomplishment of a number of coordination techniques and ordering practices, of ground rules and negotiations that make sure that such a Nature is at hand.

Yet the aim of this article is not so much to applaud the achievement of one Nature, an achievement that often showed its downsides (at least as much as its positive sides are evident). More than offering a celebration of Nature, unhinging the coherence of naturalism and considering coordination practices does something else. Unpacking coherences is an important task of anthropology and STS. From Strathern and Mol, we have learned that *juxtaposition* and *comparison* are important tools to undo the ground rules that organize plural natures into coherent wholes. This kind of contrast is also the strategy I employ in this article. Putting a dead worm next to a dot one makes some of their differences and similarities explicit. It shows, I argue, that what characterizes the practices of 'Western naturalist' scientists is not so much a unitary Nature as a given, but rather the ability to coordinate differences and create coherence. It is their ability to move between different natures. The coordination practices that allow scientists to move from one site to another, or from one scale to another, and not lose their orientation, make these movements easier. The tendency, common among those who do not busy themselves directly with scientists at work, to stress the static aspect of 'Western naturalism' and its disposition to order is then inverted. Once we consider practices ethnographically, we are reminded that the relevant features of 'Western thought' are not only the ones that produce static coherence, but also – if not primarily – the dynamic ones that allow one to move through coherences, question

them and rearrange them. Shifting our focus from the coherence of naturalist Nature to the practices that make this coherence possible, that coordinate it, unsettles the reification of an image of 'the West' as *only* classificatory, organizational, accumulative. In this way 'the West' and, more specifically, 'Western naturalist science' are not familiar anymore. Instead they are surprising. They cannot be dismissed as common sense, and they are too prominent to be discarded as easily as Descola seems to do.

There is more to it. Just as the Nature of naturalism that is not unitary before the practices, but only as an (always temporary) result of coordination practices, 'the West' is also something achieved in practices. What 'the West' is, then, is recast as something always done in different practices in different ways. Different coordination practices allow us to enact the 'West': it is not a given, but something achieved in practices, open to ethnographic study and (political) intervention. What studying 'Western naturalist science', or science in 'the West', means then is not obvious. As much as there is no unitary Nature before the practices, given 'out there', there is no given 'West'. This is all the more relevant in a field in which what we study travels easily through the lines cutting up 'West and the Rest'. The ways in which 'the West' is done are changing and should not be treated as something stable and fixed out there.¹⁴

Anthropology, then, needs to engage further with naturalist science 'at home'. Remembering that coherence is always something achieved (and that is achieved *together*, since no coherence would come without worms, scientists, lay people, glass jars, mustard, computers, and software engineers) means also attending to the tensions of the practices. It means being aware that coherences are not given, that naturalism, not surprisingly, is not natural. It means keeping our interventions open to changes, attending to the frictions and thus avoiding an urge to 'explain away' natures. Engaging with science, in this sense, does not mean uncritically taking on scientific achievements as matters of fact as much as it does not simply mean discarding science as a 'Western' construct. Engaging with science is about attending to the practices of science and what they afford us, about dirtying our hands with science. About keeping the multiplicity of natures in tension to 'stay with the trouble' (Haraway 2008, 2010). It is not about describing something that is already there, but about making *interventions* that can also shift what 'the West' is. In this sense, as Gad and Jensen put it, 'the writing and theorizing of the STS researcher cannot be separated from intervening but is integral to it' (2010: 67). Thus, engaging with science is about keeping science open to wonder and surprise, against the rigidity of dogmatism and eliminativism, and preventing its enrolment in the service of public order (cf. Stengers 2007). Attending to 'Western naturalist science' then is not only interesting for the insights it can offer to anthropology, but also for the sciences, which can find in anthropology an ally in their struggle against eliminativist, reductionist 'bad science'.

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Notes

1. An insightful characterization of the differences between Descola and Viveiros de Castro can be found in Latour 2009. While the debate he refers to could be read by someone as a matter of levels of analysis, I align with Viveiros de Castro in considering perspectivism – or the opening of the ontology of nature (-cultures) to multiplicity – not as a ‘type’. I hold, however, that it should also not be a ‘bomb’, but a slow and careful *sabotage*, an engineer’s tinkering both with practices and theory.
2. The exchange between STS and anthropology is well established, and has already resulted in much fruitful work (cf. Hayden 2003, Fisher 2009; Helmreich 2009; Jensen and Rødje 2009, just to name a few). This is particularly true for ANT, even if the way this shorthand travels between disciplines often requires a cautionary tale (cf. Gad and Jensen 2010).
3. In a way, this multiplication of reality echoes the ‘more than one, less than many’, ever-expanding and partially connected world that Strathern’s comparisons propose (Strathern 2004; cf. Holbraad and Pedersen 2009), also bringing testimony to the intense traffic of ideas between STS and anthropology (cf. note 2).
4. The grammatical tension between ‘a singular object’ and ‘earthworms’ is not accidental. Rather, it is crucial: reducing the tension between the multiplicity and the singularity of the worm, I suggest in this paper, is exactly what naturalist Nature is about.
5. From <<http://www.nhm.ac.uk/nature-online/collections-at-the-museum/our-curators/index.html>>, (accessed 29 February 2012).
6. From <<http://www.earthwormsoc.org.uk/recording-scheme/information-and-downloads>>, (accessed 29 February 2012).
7. This and all following quotations are from <<http://www.opalexplornature.org/soilsurvey>>, (accessed 29 February 2012).
8. This deserves more explication. This move from *understandings* of reality to *practices* of reality is a philosophical move, which informs Mol’s empirical philosophy (cf. 2002b), as I suggested in the introduction. It originated with the later Wittgenstein, more specifically with the shift that characterizes his *Philosophical Investigations* (2001). There, instead of considering language as a logico-mathematical system, he presented it *as a practice*. This resonates with Mol’s analysis of atherosclerosis (2002a) in which *talking* about walking becomes a relevant practice and not only a rhetorical discourse. It follows that language is not something distinct from practices, but it is also done in practices.
9. Permit me to use ‘the West’ in inverted commas. In the conclusions, my reasons will become clear.
10. Here the work of Strathern is enlightening: ‘At least two orders of perspectives can be readily identified in the way Westerners take up positions on things. One is the observer’s facility to move between discrete and/or overlapping domains or systems, as one might move from an economic to a political analysis of (say) ceremonial exchange. The other is the facility to alter the magnitude of phenomena, from dealing (say) with a single transaction to dealing with many, or transactions in a single society to transactions in many’ (Strathern 2004: xiv).
11. For a classic overview of this field, see Macdonald and Fyfe 1996.
12. In this sense, this coordination technique resonates with the way I mobilized the category of earthworms in this article. This holds together the multiplicity of the worm, turning it into a plurality: from heterogeneous things (dead worms, dots, data) into homogeneous worms. In this regard, Candea reminded me of the old Linnaean taxa of worms (*Vermes*) in Gould’s *Wonderful Life*: ‘Worms are the classic garbage-pail group of taxonomy – the slop bucket for the dribs and drabs ... that don’t fit anywhere, but need to be shunted someplace when you are trying to landscape the estate into rigorous order. ... most animals are basically elongate and bilaterally symmetrical. So if a creature displays this form, and you don’t know what it is, call it a worm’ (Gould 1989: 142).

13. This difference between plurality and multiplicity is made particularly clear in Law 2004.
14. There is a large body of literature attempting to undo a simplistic notion of 'the West' that considers exactly this. See, for two different examples, Gaonkar 2001 and Tsing 2005.

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