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SPECIAL COLLECTION
Resource Materialities: New Anthropological Perspectives on Natural Resource Environments

INTRODUCTION

Resource Materialities

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Demand for natural resources such as oil, water, and land remain undiminished at the start of the 21st century despite growing public anxiety about their depletion. As key resources become scarce, new resources come into existence. Across the globe, states and corporations have redoubled efforts to extract conventional and unconventional resources in an attempt to deliver ongoing prosperity to citizens and shareholders. The contradictions and violence of these endeavors are most apparent in state-sanctioned encroachment of multinational companies on indigenous and other rural lands.

The resurgence of anthropological research on natural resources, a field with a long and continuous trajectory, stems from the recognition of these dilemmas and their growing impact on the peoples and places anthropologists study. Until the past decade and a half, anthropological studies tended to focus—with some noteable exceptions—on agriculture, hunting, fishing, foraging, and similar activities involving the exploitation of so-called renewable resources. However, more and more anthropologists have turned their attention to the study of natural resources per se. They have produced studies of water, sapphires, gold, oil, coltan, forests, and biodiversity (Acheson 2006, Behrends et al. 2011, Mantz 2008, Orlove and Caton 2010, Whiteford and Whiteford 2005), of specific extractive regions such as Australia and Papua New Guinea (Rumsey and Weiner 2004), of modes of engagement with resources such as

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extraction and conservation (Ballard and Banks 2003, Carrier and West 2009), and of conceptualizations of specific resource processes such as adaptation and commoditization. The common refrain of these studies is that while natural resource exploitation continues to play a critical part in shaping the human condition, it does not do so in a uniform or environmentally deterministic manner. However, with the exception of Ferry and Limbert's (2008a) stimulating edited volume, little effort has been made to examine resources as a theoretical and comparative problem in a way that would conceive of their "resourceness" as going beyond their status as particular kinds of commodities.

This special collection explores questions in the anthropology of natural resources that have thus far remained implicit, including questions about resources' specific characteristics and capacities, the processes through which they come into being, and how such processes of resource making can be studied ethnographically. We suggest that placing these kinds of questions—questions of an ontological bent—at the center of inquiry can enhance the possibilities for a comparative ethnographic analysis. They also help interrogate the logics that perpetuate natural resource exploitation and specify an anthropological intervention in cross-disciplinary debates. Our questions arise out of broader intellectual trends in the social sciences and philosophy to which anthropologists have contributed that probe the legacies of modernist divisions between human and nonhuman, the social and the material, and what is active and what is acted upon in the environment. Terms such as "socionature" (Swyngedouw 1999), "natureculture" (Haraway 1997, Latour 1993), "nature regimes" (Escobar 1999), or "second nature" (Biersack 2006) have been developed to convey the sense that nature "is *humanly* produced (through conceptualization as well as activity) and that [it] therefore partakes, but without being entirely, of the human" (2006:14).

Natural resource exploitation—as a sustained project of abstracting substances identified as useful, valuable, and natural in origin from their environment—has long played a central role in that continuing human effort to become "modern." It is a process of boundary making par excellence—of distinguishing subject from object, nature from culture, and science from politics (Latour 1993). The intellectual agenda of scholars mentioned above, sometimes dubbed "posthumanist" or "new materialist," has been partly driven by ethical concerns about climate change and ecological disasters, and the exploitation of resource environments.

One of anthropology's key contributions to these discussions stems from research about the differences in how people relate to their surroundings and about worlds premised on principles other than modernist ones (Descola and Pálsson 1996, Ingold 2000, Strathern 1980). Curiously, geographers have been quicker than anthropologists to import concepts of nonhuman or material agency, which have also emerged from anthropological work, back into the study of resources *as such* (Bakker and Bridge 2006, Bridge 2009, Kaup 2008). In this special collection, we draw these insights into anthropology. Our aim is, first, to push the anthropological study of natural resources in new directions and, second, to show how a consideration of resources might contribute something distinct to broader social science debates about materiality.

Natural resources are ubiquitous and energetic substances that play an active part in the making of worlds. What we term "resource materialities" builds on recent critical rethinking of "the material" across the social sciences. Our analysis draws attention to resource making as a material process, in a way that considers "the conjunction of the social and the material without the social swallowing the material" (Knappett 2007:20; see also Harvey and Knox 2010). In doing so, we challenge what we identify as a residual modernism which connects anthropological analyses of resources to the techno-scientific practices that characterize the project of resource extraction. We see evidence of residual modernism in two tendencies in recent anthropological discussions: first, a tendency to center intellectual discussions and analysis on individual resource substances rather than substances that are part of a relational material world; and second, a tendency to focus on the commodity status of resources rather than asking ethnographically what else they might be at any given point in time.

The articles in this special collection approach substances such as water, land, trees, sea snails, copper, and red mercury as part of "resource environments." This term directs analytical attention away from resources as substances with essential qualities that are assumed to exist "in nature" to the complex arrangements of physical stuff, extractive infrastructures, calculative devices, discourses of the market and development, the nation and the corporation, everyday practices, and so on, that allow those substances to exist as resources. Veronica Davidov's article analyzes the shifting fate of the remote Ecuadorian Intag region where land, copper, and a biodiverse flora have successively figured

in different projects of resource exploitation, pitting settlers (*colonos*) against the state. Intriguingly, while their relationship to the forest had traditionally been mediated by machete and chainsaw, colonos are now mobilizing as the forest's prime defenders against the state's pursuit of its own specific version of neoliberal resource development. Ståle Knudsen explores the conflicting renderings of the Rapana sea snail in the Black Sea, which is poised between being a useful economic resource and a threatening alien species. While Turkish fisherman seek to profit from Rapana through ever new ways of extraction, ingeniously adapting to the sea snails' varying size and numbers, scientists raise concerns about the impact Rapana has had on other species with which it shares waters. Maarten Onneweer's article focuses on an elusive, or even phantasmagoric, resource—red mercury—as it permeates the hopeful stories of people in the Kitui district of Kenya. Skilled locals and elite outsiders with their special technologies are seen to have privileged access to this stuff of both dreams and life-threatening danger.

This introduction provides the conceptual background to situate the articles and proposes a new methodological framework for the study of natural resources. The processes of resource extraction generate a constant reworking of the boundaries between nature and culture, between "things that already are" within different cosmologies and the humanly or socially produced (cf. Ferry and Limbert 2008b:6). We argue that natural resources are inherently *distributed things* whose essence or character is to be located neither exclusively in their biophysical properties nor in webs of socio-cultural meaning. By "distributed," we refer to both the spatial and temporal extensions of specific resources, and their material and ontological dispersion. We demonstrate how this differs from conceiving of natural resources simply as "culturally reworked nature," which would leave the domains of nature and culture and the human and the nonhuman conceptually intact. By contrast, the methodological framework we propose here starts from the assumption that we are dealing with relational phenomena of what we call "resource materialities." This involves the combined examination of the matters, knowledges, infrastructures, and experiences that come together in the appreciation, extraction, processing, and consumption of natural resources. We conclude by briefly pointing to the implications of this approach for anthropological conceptions of materials and materiality, more generally.

Themes in the Anthropology of Natural Resources

Predecessors for an anthropology of natural resources can be found in different anthropological traditions. These include the cultural ecology school in the US of which Rappaport (1968) was a leading example, as well as studies of the socio-cultural effects of mining in Africa during the earlier half of the 20th century by anthropologists in the British Manchester school (Epstein 1958, Ferguson 1999). The focus on resources was sharpened in the political economic studies of the 1970s, and in political ecology which has become a prolific interdisciplinary field. From the 1980s, anthropologists largely examined resources under the banner of "development" or "the environment" (e.g., Croll and Parkin 1992, Dove and Carpenter 2008). More recently, they have begun to assess the distinctive, but also increasingly generic, modes in which people engage with natural resources in different parts of the world, including forms of resource extraction, property, patrimony, conservation, overuse, and waste (e.g., Anderson and Berglund 2003, Carrier and West 2009, Li 2010, Rumsey and Weiner 2004). In offering a fresh approach to the subject, we do not wish to discard this valuable work, but point to a more comprehensive way of understanding what we term processes of resource making.

In order to distinguish the present proposal more clearly from existing work, and for readers less familiar with the field, we want to briefly highlight three prominent cross-cutting themes in the existing anthropological literature. The themes we have chosen are classic anthropological themes, namely, sociality, signification (Behrends and Schareika 2010), and value. Together they exemplify, in our view, a characteristic anthropological take on resources, and bring out the specific strengths that the discipline has contributed to this field of research.[1]

First, anthropologists have demonstrated how resource exploitation may be associated directly or indirectly with changing group relations, social structures, and other emergent forms of sociality. Natural resources, they show, are not only socially produced, but also produce novel social configurations. For example, the emergence of new settlements around points of extraction has been characteristic of resource making. Mines and resource prospects attract people with their opportunities for labor and other economic possibilities; their associated structures of work, housing, and health and social services give a specific material shape to people's lives (e.g., Ferguson 1999, Nash 1993, Tinker Salas 2009). Even in situations where people are not drawn into the production

circuit directly as laborers, resource extraction may open up new income streams—either from revenues or from compensation for lost sources of livelihood or environmental damages—which can have enormous impact on prevalent forms of conviviality and alliances. In such situations, local communities and indigenous residents are frequently enlisted as "stakeholders" in the process, mobilizing around newly shared interests and grievances. Ethnic ties and senses of belonging to the land or to local groups are mobilized where resource entitlement needs to be asserted (e.g., Gilberthorpe 2007, Jorgensen 2006). Ethnographies of these situations show that, far from leading to consensus and cooperation, so-called corporate social responsibility and similar activities may be ridden with conflicts, occasionally fuelled or exploited by state and corporate entities (e.g., Kirsch 2002, 2006, 2007; Sawyer 2004). In other words, commodified nature becomes an item of contestation inserted into often deeply unequal and unsettled sets of social relations (Ferguson 2005; Watts 2001, 2004); this is something that educational and social programs or the logic of compensation frequently fail to recognize.

A second line of anthropological inquiry has highlighted the central role that natural resources play in the meaning-making practices and symbolic repertoires of nation-states (see also Behrends and Schareika 2010). The inclusion of cultural and symbolic aspects into what would otherwise seem straightforward political economic analyses is partly what has distinguished the anthropological study of resources from more mainstream analyses (e.g., Biersack 1999a, Biersack and Greenberg 2006, Sawyer 2001). Ethnographic studies detail the many future-oriented plans for action that represent the fate of political communities, elites, and entire nations as closely entwined with the fortunes and possibilities presented by a particular resource. Oil in particular, due to its apparent capacity to absorb and override other sectors and pursuits within national economies, has a tendency to redefine national self-conceptions in its name. This puzzling phenomenon has been observed in countries as different as Nigeria, Venezuela, Argentina, or Libya (e.g., Apter 2005, Coronil 1997, Davis 1987, Shever 2012). Conversely, as Limbert (2008, 2010) has shown for Oman, even where people had only a very indirect experience of oil—in the form of an inflated state bureaucracy, refineries, and pipelines that connect extractive sites in the desert to urban centers and ports—the anticipated depletion of petroleum reserves can generate considerable political, economic, and cultural uncertainty.

Third, anthropologists have helped to fine-tune our understanding of processes of value formation and commoditization in relation to resources within capitalist economies (e.g., Mintz 1985, Nash 1993, Taussig 1980, Wolf 1982). They have demonstrated the complex interplay between capitalist and other types of value regimes. Fernando Coronil's (1997:42) work on the Venezuelan oil economy is exemplary in this regard, arguing for the inclusion of nature or material wealth (i.e., natural resources) in analyses of underdevelopment where previously labor (and the international division of labor) was the primary focus. Other anthropological studies have demonstrated how people may simultaneously value the same substance in different ways, for example, as common property, sacred substance, or as raw material (Strang 2004). Ferry (2002, 2005) describes how in a silver mining cooperative in Guanjuato, Mexico, members of the cooperative treat silver from the mines both as a commodity to be exchanged on a global market and as a type of inalienable property. The value of mineral specimens from this same cooperative transforms as they move from the site of extraction (where they index social relations) to museums and private collections (where connections to human social relations are erased). By contrast, we find the reverse process in Walsh's (2010) study of natural sapphires where vendors provide precise detail on sapphires' origins in order to establish their "natural" pedigree, which contributes to the high value of particular gems.

Taken together, this body of work has provided rich accounts of resource making as a human endeavor. It illustrates that there is much more to the value of natural resources than the resource per se, conceived of as a substance with specific physical and chemical properties and, hence, particular types of capacities and uses. What these accounts have emphasized to good effect are the scale-making practices that characterize resource making (Tsing 2005), as well as the interrelation between the production of resources as valuable objects and the production of human subjectivities and, indeed, entire cosmologies. However, in these accounts it is characteristically humans who are in a position of mastery and control over what is portrayed as an essentially passive material world. When Ferry writes that "notions of silver as substance and place enhance the sense of silver as inalienable possession" (2002:332), she acknowledges the significance of the sensual and physical properties of the substances at hand—and not just of the miners, company directors, and buyers—in the formation of the resource environment she describes.

It is this kind of insight that we wish to take further in order to pry open an analytical space where we can ask: how do resources come to matter beyond their commodified form?

The Becoming of Resources

Resources come to exist both through technical invention and physical production, as well as through acts of epistemological and ontological creativity.[2] Resource making has been conceived as a process of turning nature into culture par excellence. For resource economist Edward Barbier, for example, resources are "fixed endowments," including diverse sources of energy, raw materials, and land, that are "provided [...] freely by nature and geology, and that are distributed randomly across regions and countries" (2011:6). From the sparkling strength of diamonds to the sticky versatility of crude, in this account, they are already given in the world, only waiting to be utilized.

For others, resources are far from naturally occurring, and their exploitation is key to their very existence. According to the OED, an integral part of what makes something a resource is its use for an end, particularly the creation of wealth. Similarly, in outlining an integrated anthropological framework, Ferry and Limbert define resources as "objects and substances produced from 'nature' for human enrichment and use" (2008b:3). In this view, resources are irreducibly social. People consider them to be useful and valuable, inevitably attaching meanings to them which may vary between and within societies (Bridge 2009). Importantly, resources are not just there—present in nature and ready for human consumption—but, as resource economist Erich Zimmermann (1933) argued, are *made* through processes of appraisal and human labor. For Zimmermann, the notion of a resource is a subjective concept, dependent on the needs and wants of the appraiser. For example,

> [c]oal, simply because of its physical structure or chemical composition, would not be a resource; but it becomes one because man possesses wants which can be satisfied by releasing its stored-up energy and turning it into heat or work or some other usable form, and because man possesses the power to utilize coal in that manner. To be considered for its resources, the environment must be brought into *relationship* to man. (1933:3)

Zimmermann proposed a notion of resources as essentially "functional" and as "relative" to people's wants and their ability to appropriate the environment. These wants and ways of appropriation, he demonstrated, have differed significantly through history and across societies, depending on standards of living, socio-cultural objectives, the division of labor, and so on. Put briefly, while trade relationships with other societies led to a new appraisal of resources as goods for exchange, industrial capitalism necessitated the deployment of an ever-growing number of resources to build and drive the machines characteristically used to increase production (Zimmermann 1933:21). In the course of the 20th century, this has been reflected in persistent tensions between the valuation of resources as commodities traded in global commodity markets and as national endowments serving primarily domestic industries (Barbier 2011:554).

The ethnographic record shows in rich detail how pre-capitalist, colonial, and post-colonial economies have followed very different developments regarding the appreciation and exploitation of resources by global and local actors (e.g., Apter 2005, Coronil 1997, Ferguson 1999, Wolf 1982; see also Barbier 2011). While among the Incas silver and gold were attributed with limited exchange value and used almost exclusively for ornamentation, it was only with the arrival of the Spanish *conquistadores*—in whose cosmology gold figured as an item of wealth and a basis of (monetary) value, more generally—that the substance came to be fundamentally reconfigured (Taussig 1980:199). In many parts of pre-Columbian South America, gold served to restore the equilibrium between people and their gods, or what may crudely be referred to as nature embodied in lakes and water bodies. Gold thus linked humans to water, itself considered a sacred resource in the region. Notions of water's sacredness have reverberated in more recent protests regarding the privatization of water as a neoliberal development exercise among Bolivia's peasants and urbanites (Nash 2007). From this perspective, clashes between Spanish conquistadores and indigenous peoples or between neoliberal logics and local cosmologies are not only matters of brute physical and economic force but also of an "ontological conflict" (Blaser 2009) regarding the status of resource substances.

The mobilization of natural resources as it occurs, for example, in resource extraction begins, in an important sense, with abstraction. Abstraction, as we define it here, includes separation, parting, simplification, and reduction (and, occasionally, addition) on both material and conceptual levels. Panning divorces gold from water, and various treatments

allow gold to part from the sulfide minerals and carbon it traps. Precious stones such as sapphires, as Walsh (2010) explains, do not exist as gems ready to be picked up and sold on the world market. They are varieties of corundum, a mineral that can now be produced synthetically. Both synthetic and natural sapphires are formed through processes of heat and pressure. Whereas synthetic sapphires are created in a lab, natural sapphires form over thousands of years in the depths of the earth. Synthesis may be seen as abstraction taken to its extreme, where "nature" serves only as a blueprint to be imitated. However, "natural" sapphires, too, often have impurities as a result of which they need to be "cooked" and "enhanced" through the introduction of other elements.

Physical abstraction may be paralleled by homogenization, standardization, and a certain de-differentiation of the resource in question (Ferry 2002:342-343), involving different types of labor carried out not just by corporations and miners who physically remove the resources from their surroundings, but by everyone involved in their naming, scientific analysis, sale, and so on. The appearance of resources as natural, given, and ready for human use that has become so familiar to us is the result of this labor. Abstraction, in the broadest sense, underwrites the political economic standardization of resources, contributing to their exchangeability and fungibility in local and global markets. However, this process is not irreversible.

One of Zimmermann's key ideas was to show that resources do not simply exist in a fixed and finite state, but are instead constantly in the making. Resources, as he put it in a now well-known phrase, are not; "they become" (1933:3). Zimmermann's dictum still appeals today, even though his understanding of this process was far removed from the naturecultures analyzed by contemporary scholars (Escobar 1999, Haraway 1997, Latour 1993, Swyngedouw 1999). Indeed, scholarly understandings of how resources "become" have changed considerably throughout the decades. In the 1980s, for example, economist Thomas DeGregori (1987) interpreted Zimmermann's words with what, in retrospect, appears to be frightening optimism. Countering contemporary fears about environmental degradation, DeGregori claimed that rather than being depleted, resources are continuously made anew through human ingenuity. As Bridge (2009:1217-1218) notes, in the 1980s and 1990s the worry that there were "limits to growth" seemed to be replaced by a sense that humans had mastered resource shortage and were increasingly able to feed a fast-expanding world population. In this view, resources were becoming anew on a daily basis.

Still today, despite growing environmental awareness of the paradoxes and contradictions that characterize human resource consumption in the face of rising primary commodity prices, anticipated resource scarcity, and a global financial crisis, the dominant response has *not* been less growth.

In formulating a contemporary anthropology of natural resources, a notion of resources as "becoming" still seems to be of critical importance. Resource potentiality, as we suggested, has its own historicity. A multitude of political, economic, and cultural factors contribute to the shifts and disruptions in the way that resources are conceptualized and matter over time. Zimmermann's notion of becoming can be rethought in light of literature that critiques modernist conceptions of nature and matter. Capitalist forms of resource extraction, for example, cast resources not as the products of lively, mutual human/nonhuman interactions but as, essentially, dead matter dis-embedded from the environments in which they are found (Coronil 1997, Ferry and Limbert 2008b:8, Tsing 2005). A critical questioning of this status quo now comes from a body of work that has been propelled partly by environmental disasters and climate change into thinking about the liveliness of the supposedly "inanimate" world and its natural-social-technological constitution (e.g., Barry 2001; Bennett 2010; Clark 2010; Haraway 1997; Latour 1993, 2004).

We argue that, rather than being purely an issue of human control and ingenuity, the "becoming" of resources is now better understood in terms of the uses and possibilities that matter affords to us—what may be referred to as material agency or potentiality. This is always informed by the historical, social, and material environments within which resource matters are constituted (cf. Barry 2005, following Bensaude-Vincent and Stengers 1996). Becoming, following a Deleuzian usage of the term, is what happens when the constituents of the resource assemblage shift and change, when elements are drawn into the assemblage, and others expelled (Deleuze and Guattari 1987). Deleuze (1990:170-171, 185-186) identifies "becoming" as the process of creating something altogether new and unexpected, something that emerges from a realm situated in relation to but also "beyond history." From this perspective, becoming refers to a particular kind of (historicized) *ontology* of resources. As a result, the becoming of resources is not a linear unfolding but rather an oscillation between different states of being, which include the "natural" or, rather, unprocessed state ("things that already are") and the commodity state of the substance in question but are not exhausted by them.

Resources may revert to other states of being, and be different things to different people at the same time, as Ferry's work on silver or Walsh's work on sapphires illustrates. In short, we do not see the "ontology" and "historicity" of resources or of the relationship between society and nature, more generally, as either-or analytical options (cf. Coronil 1997:26). Instead, we aim to explore how resource ontologies have a history and how the unfolding of resource histories also contains an interplay and contest between different ontologies. From this perspective, natural resources are not "out there" ready to be seized upon and utilized but always in flux and open-ended. They "become" *as resource materialities*, that is, as constitutive of and constituted within arrangements of substances, technologies, discourses, and the practices deployed by different kinds of actors.

Assembling Resource Materialities

The "resource materialities" framework we develop in this section is intended as a flexible (but, we hope, reasonably comprehensive) methodology, comprised of a set of elements to be studied and compared. The aim of this framework is to tease out the distributed and relational character of resources. It moves beyond the simple wedding of sociological issues with a "materialist stance" by taking into account the questions about the ontology of resources that we outlined above. It is also an anthropological response to recent research in resource geography, which similarly introduces critical questions about materiality into the political economic study of resources (Bakker and Bridge 2006).[3] However, we wish to push this analysis further. "Resource materialities" entail far more than a reference to materials that are named as resources—such as gold, feldspar, water, or timber—and their specific physical and chemical properties. In addition, we suggest that the analysis of resources needs to include a consideration of the following: first, resource ontologies, that is, assumptions about the nature and affordances of the "things that are already" and their participation in making local, regional, national, and global scales; second, the different ways in which specific resources are known; third, the infrastructures designed to extract resources and those needed to refine, transform, and transport them; and fourth, how resources are experienced and embodied by people who work with, transform, or (deliberately or accidentally) ingest them. We will elaborate these points below.

"Matter," "materialism," and "materiality" are not new concepts in anthropology, generally, or in the study of natural resources, in particular. The neo-Marxist and political economy approaches that emerged from the 1960s onwards had a keen eye for the material basis of society and social inequality—of which resources constitute a primary building block. A neo-Marxist material approach to resources also reverberated in the field of political ecology. Since its emergence in the 1970s, political ecology has focused on issues such as how the control of and access to natural resources is shaped by changes in the biophysical environment and the broader political economy (Goldman and Turner 2011:6-7; see also Biersack and Greenberg 2006, Peluso and Watts 2001, Watts and Peet 2004). While we do not think that concerns about resource ownership, access, markets, and the state are unimportant—far from it!—we concur with Bill Maurer's (2006) assessment that materiality as posited in dialectical or historical materialism needs to be reconsidered. As Maurer argues, we need to rethink the ontological distinctions of ideal and material, spirit and matter that haunt Marxism as well as the realist and empiricist epistemological positions that have worked in tandem with them. Rather than seeing matter and thought as playing off each other, they are better thought of as entwined in complex, non-linear ways.

In anthropology, such a rethinking of the nature of things has long been nourished by critical studies of consumption and material culture. Arjun Appadurai's *The Social Life of Things* (1986) already argued for a processual understanding of things as embedded in socio-material flows, breaking down the long-standing gift-commodity dichotomy that had dominated anthropological analyses of goods. The "social life" approach made possible questions that are also important in analyzing natural resources, for instance, about the workings of commodity chains and the relations between categories of objects (commodities, non-commodities). However, despite their inclusive scope, research following in Appadurai's footsteps has, with some exceptions, tended to concentrate on individual artifacts and has rarely considered the kind of indistinct, dispersed, and continually transforming substances such as natural resources (e.g., Gell 1998; Miller 2005; Tilley 1994, 2004). The focus of this work has been on the relationship between objects and subjects and the vexed question of the "agency" of matter,[4] rather than on following through the insight from science and technology studies analyses that things are themselves relational effects, something we see as critical to rethinking natural resources.

The focus of material culture studies on artifacts and the relative disregard for the dispersed things that are resources is intriguing. This may be because materials (and this would include natural resources) constitute a significant part of our material culture with which human beings engage on a day-to-day basis, whether directly—by extracting or processing the resources—or indirectly—by handling and consuming all kinds of things fabricated from them (Ingold 2007, 2012). Despite, or because of, the contemporary "material turn" in the social sciences, Ingold notes that anthropologists have paid scant attention to the actual materials and material processes that make up our worlds. Instead, materiality has come to be treated as something that can be conceptually separated out as one particular quality or aspect among many. The re-engagement with materiality proposed by Ingold and others has been partly conceived as a necessary critique of the postmodern, social constructivist, and textually oriented approaches of the 1980s and 1990s, which seemed to overlook materiality altogether. However, the "return to" materiality has frequently resulted in an empiricist revival rather than an engagement with the ontology of resource materials in a comparative perspective.

We argue that thinking relationally about things is by far the more challenging lesson to be learned from the recent "material turn" in philosophy and social sciences. Thinking in terms of relationality and distributedness means prioritizing relations over substances or essences in conceptualizing how the world is constituted. In our view, natural resources offer a particularly fruitful empirical window through which to study the implications for social science research of this radical rethinking of the ontology of matter. Aside from being characterized by their generativity (Ferry and Limbert 2008b) and their capacity to bring other things into being, resources have a distinct spatiality: they may be both dispersed and concentrated, and they are entwined with human biological, social, and political metabolisms and life in multiple ways. They exist not just in one form, but are finite or limitless, renewable or non-renewable. Most importantly, we hope to have demonstrated that their existence is predicated on an assemblage (of practices, expertise, infrastructures, etc.). These properties pose challenges for an anthropological inquiry that are quite different from bounded artifacts.

We propose "resource materialities" as a rough, practical guide for teasing out the specificity of resources as relational assemblages. First, resource ontologies—assumptions about what resource substances are,

their affordances, and what sustains them—are key to understanding what resources can be made to do, and how they are known, circulated, and engaged with (e.g., Biersack 1999b, Chapman 2013, Jorgensen 1998, Weiner 1994, West 2006). The ethnographic record reveals competing resource ontologies that continue to vie with techno-scientific accountings, which have become the dominant frame for conceiving of natural resources. For example, for pilgrims and ritual specialists in Northern India, the Ganga River is part of a cosmic order—a Goddess whose motherly capacity for spiritual purification is infinite. This contrasts with environmentalists' and officials' scientific materialist versions of polluted water resources (Alley 2002:11, 32). Similarly, wildlife co-management projects in different parts of the world may reveal deep misunderstandings that arise from the fact that animals are different entities to wildlife biologists and to indigenous hunters. Modern biology dismisses hunters' claims that animals are intentional beings whose populations are maintained through acts of reciprocity, acts that include killing an animal if it offers itself to a hunter (see Nadasdy 2007 on First Nations hunters in Canada's Yukon territories) and redistributing its meat (see Blaser 2009 on Yshiro hunters in Paraguay). Protests that contributed to halting a mining project in the Peruvian Andes were motivated not only by concerns about the loss of livelihoods, but also by Pachanta villagers' relationship with the mountain Ausangate as a being who could harm people if treated inappropriately, for example, by the mining company's use of mountaintop removal technology (de la Cadena 2010). Anthropology has been particularly good at grasping how, in such moments of conflict, scientific renderings of resources are in conflict with different accountings of the make up of the world.

Second, a multitude of complexly intertwined knowledges are implicated in bringing resources into being and transforming them. For example, expert knowledges mobilize a set of techniques and measurements through which resources "become" in different ways. Consider how fluorescence techniques determine sulfur levels in petroleum, how refractometers and polariscopes measure the purity of gemstones, and how the complex economic models analyze and translate balances of supply and demand into equivalents of sums of money (cf. Appel 2012, Mason 2007, Walsh 2010). The "discovery" of a new "resource" may trigger the elaboration of fresh knowledge about the substance in question; in turn, practices of knowledge production (and technology) can produce natural resources as new epistemic objects. Economists and political scientists have come to employ

increasingly formulaic imaginaries in apprehending the possible negative social, political, and economic effects of resources (Behrends 2008; Reyna 2007; Weszkalnys 2010, 2011). When they are translated into policy advice, legislative models, and norms for ethical conduct in the industry, they fulfill an ambiguous double role, first, of holding governments accountable, and second, of helping to improve the reputation and profits of private corporations (Barry 2006, Gardner 2012, Rajak 2011). These kinds of moral apprehensions regarding resources might be juxtaposed with instances of resource use elsewhere in which religious and moral knowledge is invoked. Ritual and ecological knowledge are virtually inseparable, for example, in the Balinese irrigation system that effectively managed the flow of water for centuries through multiple watersheds (Lansing 1991). By the same token, Bolivian miners' claim to be able to "sense" the mineral veins running through the mountain (Nash 1993) likely stems from technical skills and "adaptive" knowledge of the environment *and* from ritual relationships that they cultivate with the mountain (see also Kirsch 2006).

Third, infrastructures generate and constrain knowledge production about resources, and make possible particular forms of politics. Resource infrastructures include not only everyday governance techniques of state and corporate bureaucracies mobilized in corporate social responsibility programs, but also the large-scale technologies used to extract resources from their environment and to circulate them (Anand 2011, Appel 2012, Carse 2012, Hughes 2006). For example, the use of different kinds of pumps and canals in small and large-scale land reclamation projects in the Nile Valley brings water into relation with desert land, thereby expanding the possibilities for agriculture (Barnes 2012). However, as the pumps redirect the flow of water to land, they also produce intra-community conflicts, as some farmers are able to generate more income while the lands of other farmers become uncultivable. Extractive and distributive infrastructures and the relations they mobilize are thus key enactments of resource potential. In addition, infrastructures make possible particular political formations and regimes of rule and misrule (e.g., Le Billon 2001, Mitchell 2009, Weszkalnys 2013). They can also become the focus of protests related to resource access, ownership and entitlement, environment, and ethics (e.g., Barry forthcoming, Reyna 2007, Valdivia 2008, Watts 2011).

Fourth, resource exploitation is a process where bodies, technologies, infrastructures, and substances become entangled, throwing the porosity between human bodies and their resource environments into sharp relief

(cf. Pálsson 2012). Coal dust indelibly seeping into the wrinkles, crevices, and cuts in miners' skin is but one example (Lindisfarne 2011). Similarly, Wyoming miners acquire an embodied sense of the texture, composition, and capacities of coal, mediated by the giant shovels and trucks they use (Rolston forthcoming). They speak of "pit sense," an intimate knowledge of how to anticipate and respond to unpredictable behavior of the coal-face, and develop skills that help safely navigate the treacherous environment even if this results in health problems such as sore shoulders and elbows or joint and back issues. The mutual encroachments of human and nonhuman in extractive sites are increasingly expressed as calculated risk. Adaptive strategies and regulations of labor routines and attire have become part of a corporate work regime that aims to redistribute such risk while maximizing productivity (Appel 2012). This is in stark contrast to the uncontrolled and largely unrecorded ways in which resources and their "associated substances" continue to enter into human metabolisms either through direct consumption or because of people's proximity to locales of extraction. In New Guinea, toxic tailings and the waste from the Ok Tedi mine pollutes the river and kills off trees, directly impacting the resource base and health of indigenous people living nearby (Kirsch 2006). Other misfortunes and accidents which were ordinarily associated with sorcery are now understood as a direct result of the mine's presence and its harmful effects on local bodies (Kirsch 2006:108). Attention to embodiment amplifies our understanding of the multiple ways of apprehending the fragility of the boundary-making efforts on which resource extraction depends.

In sum, we offer "resource materialities" as a guide to studying the multitude of ways in which resources exist beyond their valuation and circulation as commodities in global markets. The impetus to develop this framework derives from problems we encountered in our respective ethnographic projects—studying a "speculative" resource in one case (Weszkalnys n.d.) and a "failed" one in the other (Richardson n.d.)—and from a certain dissatisfaction with the kind of analytical tools we could find. Critical philosophies of materiality help interrogate conventional and reductive conceptions of resources as "nature turned culture" or purely "social constructs." Our aim is to be able to account more fully for resources' material specificity. This specificity stems from what we referred to as "distributedness"—that is, resources' material dispersal in time and space, as well as their ontological multiplicity. In other words, natural resources challenged us to put concepts of relationality into ethnographic

practice. This makes for a noticeable—but, we think, productive—tension between such a strong philosophical proposition and our insistence that, as anthropologists, we need to remain especially attuned to resources' ontological multiplicity and the worldings they make possible (Blaser 2009, de la Cadena 2010, Viveiros de Castro 2004).

Our "resource materialities" framework is an attempt to counter the contemporary "extractive project" and undiminished resource consumption with a strong notion of resources as historically and ontologically "becoming." Resources, as we have shown, are the result of an entanglement of processes and practices of abstraction, homogenization, and standardization aimed at inscribing the boundaries between nature and culture. This requires an ongoing, concerted work. However, on closer inspection, the result of this work is rather less fixed than traditional accounts of resource commodities might assume. Resources' specific properties—their dispersion, finitude, or renewability—are the outcomes of momentary stabilizations and continuous shifts in assemblages of humans and nonhumans. Seeing resources in this way undermines the essentialisms that feed the continued appropriation of resources and the contemporary drive toward over-exploitation within capitalist regimes of accumulation. In this spirit, we propose our framework not as a theoretical or philosophical universal but as a practical guide through complex ethnographic worlds.

The Articles in this Collection

Maarten Onneweer's analysis of rumors of red mercury in Kenya teases out some of the peculiarities of what resources are, how they become, and the differences between a resource in its non-commodified and commodified states. Onneweer locates the rumor in a history of encounters between Kitui residents and colonial agents and development practitioners connected with (mostly failed) attempts to transform Kitui's resource environments. The rumors describe a substance of extraordinary value that actively resists extraction and misguides the men who want to capture it in ways that parody the socialities of the development encounter. The red mercury rumor, therefore, exemplifies a more widespread moment in how resources come to exist: the moment when a substance's existence and value is conjured, but its actual location and quantities are not yet known. However, the physical absence of the substance does not mean it has no material effects. Red mercury rumors generate suspicion about outsiders

such as NGO workers, prospectors, archaeologists, and anthropologists, complicating outsider efforts to extract things from this region. While red mercury has never existed in a physical state that would enable commodification, the desire, skepticism, and uncertainty it induces plays a part in configuring Kitui as a resource environment.

Ståle Knudsen's account of the durability of the invasive Rapana sea snail as commercial fishing resource in Turkey's Black Sea is a vivid illustration of how a relational, distributed approach to materiality can help explain the dynamics of particular resource environments. Knudsen seeks to account for the rather limited impact of global biodiversity discourses in Turkey. He examines how different versions of the snail as resource, alien species, and as *haram* (unclean) for Turkish Muslims come to exist through the snails' particular relations with scientists, fishers, factory owners, factories, boats, dredging technology, and traps. The sea snail becomes a resource and commodity as the result of a complicated set of events, relationships, technologies, and actors: the snails' movements into the Black Sea; their appropriate size for Japanese consumers; the adoption of dredging technology; the creation of factories to standardize and package snails for export; and fisheries management scientists' interest in maintaining a commercial resource. Meanwhile, the snail became an object of concern as an alien invasive species for marine biologists inside and outside Turkey because the snail preys on and depletes Mediterranean mussels, a key food source for other native species. Although human valuation of materials does play a part in this story, the snails' materiality—their size, movements, and metabolisms—plays an active part in its configuration as a resource.

Whereas Knudsen's article focuses on the distributed materiality of the Rapana sea snail, Veronica Davidov's article narrates the historical succession of resource environments in Intag, Ecuador assembled around different commodified resources such as land, biodiverse forests, and copper. Davidov hones in on the struggles between farmer-conservationists and mining companies over whether cloud forest flora and fauna or minerals should anchor the regional economy. She employs "metonymic materialities" as an analytic device to capture the ways in which one component of the environment becomes dominant for a group of actors in terms of economic value and political identity. Whereas the state markets Intag as a "land of copper," Inteños emphasize its unique flora and fauna. Each side mobilizes different forms of expertise—geological surveys locating valuable

subsoil minerals, in one case, and biome maps, biodiversity, and conservation plans, on the other—as the basis for arguments over whether the extraction of minerals or the conservation of biodiversity and ecotourism should predominate. Davidov's historical account not only demonstrates the complex processes by which materials are made into resources. It also illustrates the ways in which the knowledge and technical interventions involved in making trees, birds, minerals, water, and soil into resources make certain forms of political struggle possible. ■

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The idea for this special collection arose from two panels that we organized at the meetings of the European Association of Social Anthropologists and the American Anthropological Association in 2010. We subsequently had an opportunity to present our ideas on "resource materialities" at a conference we organized in April 2012, entitled "Engaging Resources: New Anthropological Perspectives on Natural Resource Environments" sponsored by the Social Sciences and Humanities Research Council of Canada, the Wenner-Gren Foundation, Wilfrid Laurier University, and the Balsillie School of International Affairs. We would like to thank the participants in these events for their lively contributions and especially the contributors to this special collection for their perseverance and collaboration in getting it off the ground. We are particularly grateful to David Middlemiss for pointing us towards resource geography, to Louise Robert for research assistance, and to Andrew Barry, Mario Blaser, and Derek Hall for their insightful comments on earlier versions of this introduction.

Endnotes:

[1]Space does not permit us to discuss other exciting emergent themes in the anthropology of resources including the corporation, risk, expertise, or markets (see also Sawyer 2012).

[2]The category of "natural resources" is slippery and contested. While Ferry and Limbert (2008a) consider resources more broadly—including, for example, "history" as a resource—Bridge (2009:1227) makes explicit reference to synthetic, humanly produced materials. Although we recognize that neither nature/culture distinctions nor relations to the environment as resource are universals, we have decided to stick with the notion of "natural resources."

[3]Resource geographers have posed questions about the qualities and affordances of resources without attributing an essence or identity to them. For example, in Bakker's (2004) work on the privatization of water management in England and Wales, water is an "uncooperative commodity." Water's materiality—which she describes as its biophysical qualities—shapes the operation of this substance as both object and subject in political economic processes in ways that make the privatization of water supplies all the more difficult. Other geographers have examined the ways in which actors can manipulate resource materialities—such as infrastructures, pipelines, and installations as well as resource substances themselves—for their own ends (Kaup 2008, Valdivia 2008) and have explored the potential for violence and conflict that specific resources afford (Le Billon 2001). These ideas have been taken up in an interdisciplinary special issue of *Social Studies of Science*, entitled "Water Worlds" (Barnes and Alatout 2012).

[4]In anthropology, material stuff has continued to been seen as animated through the consciousness and actions of human beings (Gell 1998, Ingold 2007, Miller 2005; see also Bennett and Joyce 2010:5). More radical treatments of nonhuman agency have been influenced partly by a fruitful dialogue with science and technology studies. This work proposes a symmetrical approach to human and nonhuman actors, whereby agency is distributed throughout shifting networks of persons and things and is the effect of particular sets of relations (Latour 1987, 2004; Law and Mol 1995; Henare et al. 2007). This work has occasionally been criticized for glossing over the important qualitative difference between the agency of human and nonhuman actors (Pickering 1993; cf. Latour 2004). In this introduction, we have chosen to emphasize the relationality from which material agency or potentiality is derived, and in order to avoid easy conflations with "intentionality" or "power."

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资源的实体性：关于自然资源环境的人类学新解
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Материальности природных ресурсов: Новые антропологические взгляды на их месторождения
Введение: Материальности природных ресурсов

مجموعة خاصة
الموارد المادية: وجهات نظر أنثروبولوجية جديدة على بيئات الموارد الطبيعية
مقدمة: الموارد المادية