



How “clean gold” came to matter

Metal detectors, infrastructure, and valuation

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Recently an ancient resource—gold—gained new importance in Sudan. To inquire into the making of values and their negotiation at a time of national economic reorientation, I explore the emergence of a resource category, so-called clean gold, and link this to the introduction of a new prospecting technology—metal detectors. I follow the translation of metal detectors to Sudan and explore them in relation to a broader techno-economic infrastructure of artisanal gold mining that enables the extractive practice and circulates new forms of moral reasoning. Not only has a new resource category emerged but I argue that these devices and the moral worlds they have coconstituted have also enabled younger men to test and challenge the economic and moral authority of an older generation of men.

Keywords: metal detector, gold mining, infrastructure, technology, resources, Sudan, valuation

An incident that occurred in a rural settlement in the Lower Atbara area of north-eastern Sudan in 2010 exposed ambivalences about values of the past and uncertainties about what is presently of worth and can serve as moral guidance for imagined futures. More than two hundred people inhabited the settlement, most of them Rashaida, who largely still grew up as nomadic camel herders but had recently started to work in gold mining. I was sitting with Hussein, the schoolteacher and one of the few literate people in the settlement, to chat about his past trip to prospect for gold with a metal detector. It was the third time that Hussein had



closed the school for a number of days. People had begun to worry he might give up teaching to chase after gold like so many of his peers.

Nested in the larger social world of gold mining, working with metal detectors emerged as a new activity that elicited much excitement during my stay (2009–10). Men used these devices to prospect the terrain through electromagnetic induction. Moved over the ground, the detector's magnetic field interacts with subterranean metals, such as gold, producing signals that tell the miner where to start digging. Hussein, a young man of twenty years, was among the first in the settlement to have access to such a device. His family was established in a larger town along the Nile, where he was also educated, and his father and two of his cousins on labor migration in the Gulf pooled money and invested in a metal detector. The costs for this contraband good were enormous—even for a wealthy family—equaling nearly EUR 8,000 at the time. Hussein told me that his prospecting team had found a small amount of gold in a nearby wadi. They sold the gold nugget at the market that had emerged near the most productive artisanal gold mines in the vicinity. The money they received was enough to cover his costs and those of the workers on his team, but Hussein dreamed of greater riches. Curious to learn how prospectors figure out where to prospect, I retold a story that I had heard in the village about men who found three kilos of “clean gold,” as my interlocutors called it. They stopped their car, where nobody searched, and suddenly by intuition got the idea to prospect there on a nearby dirt road leading to the gold mines. Abruptly, Hussein got up, mumbling “it's true” and that maybe God had hidden something for him too.

He got a long cardboard package out from beneath his bed: the metal detector. Hussein sloppily strapped the battery to his back in the supplied harness, designed to avoid interferences with the coil. He then put the headphones on his ears and turned the device on. Holding the detector's shaft and putting his arm on the arm-rest, he moved the coil close to the ground several times, listened with concentration and observed the display. Looking satisfied, he then started walking, moving his arm rhythmically, sweeping the coil close to the ground from left to right, every new swing of the arms slightly overlapping with the previous. Disregarding the afternoon heat, he prospected the entire area inside the walled compound around his house, walking steadily in straight lines, while I was waiting in the shade of the house, hoping he would return to our interview.

Hussein reached the compound's wall but didn't stop prospecting there. Without looking back, he moved on frantically. Village children gathered around Hussein to watch what he was doing. Neighboring women peered out of their houses. By the time he was near the settlement's center, a large group of observers had congregated. He later claimed to have been too absorbed to notice the crowd as he prospected the open market spaces. Older men hurried out of the mosque and cafeteria, talking to him, shouting angrily, stopping him. After a short while he returned to his house. They did not let him continue to test his luck, he complained, although he must have been aware of potentially different ways of evaluating his act.



Figure 1: Hussein prospecting his compound with the metal detector

This article adds to anthropological appreciations of valuation as a social practice and the negotiation of normative orders. The above situation in a marginal area of northeastern Sudan draws attention to value transformations and to an intergenerational conflict over value; it raises question about the validity of social orders and the gap between “what is” and what different people think should be instead. I take uncertainty about what counts in any situation as starting point (along the lines of Boltanski 2011) and examine the practices through which so-called *clean gold* is constituted as a resource in northeastern Sudan. “Clean gold” (*ḍahab ṣāfi*) refers to grains, nuggets, or flakes of gold in the soil’s top layer, denoting a difference in purity to gold ore. Unlike gold that has to be mined and separated from ore, clean gold does not involve such laborious processing and can be sold immediately after it was dug out. Following how this specific subcategory—clean gold—emerged in

the region alongside the longer-established gold extraction from hard-rock ores (gold mixed with stones) can deepen the understanding of the seemingly arbitrary processes through which values are made and unmade and reworked at specific historical conjunctures.

I track the translation of the metal detector to Sudan and explore how this contributes to the constitution of a new resource category. I argue that this is a productive route to explore the constitution and negotiation of moral worlds, of values that are made pertinent in situations. Yet, to avoid ascribing too much agency in provoking social change to the technology, I take the broader techno-economic infrastructures of artisanal gold mining on which these devices rely into view. This infrastructure enabled the extractive practice, and its expansion in northeastern Sudan went along with the circulation of narratives, songs, and poems about gold mining that promoted other forms of moral evaluation. I show that the technology of metal detectors and the social worlds that they coconstituted have become a tool of a younger generation in a longer conflict with their elders over value. This lets me reflect on how the old and the new are interwoven in different orders of evaluation—one oriented toward the traditionally eminent roles of fathers and chiefs, the other rather oriented toward economic profit and divine grace. Clean gold (*dahab ṣāfi*) then is not only a possibility or resource in the conventional sense but it is an appealing signification that offers young men a way of challenging their elders' acclaimed moral and economic authority.

Theoretical deployments: Valuation, technologies, and infrastructures

I follow the translation of mobile metal-detecting devices and the moral worlds they constitute and are constituted by to contribute to debates in anthropology about valuation and technology. For a number of years a revitalized body of scholarship in the social sciences—including issues in this journal (see *HAU* 2013: vol. 3, no. 1 and 2)—has revisited the classic anthropological insight that values do not inhere in objects but result from collective processes of meaning and has sought to move the debate in new directions. Such work has paid more attention to the role of materialities in valuation as well as the multiplicity of evaluative logics and ontologies at play.¹

Pragmatic and moral sociology of critique in particular fleshed out a new approach to valuation since the 1980s that investigates the various ways in which persons, objects, and actions are evaluated—how their worth is assessed according to different criteria—in public situations. Luc Boltanski and Laurent Thévenot (2006) inductively established six so-called “orders of worth” for contemporary France that operate with different criteria of evaluation: a civic order that prizes equality, an order of inspiration where passion, creativeness, and grace are prioritized, a domestic order where reputation and seniority come first, fame where the main worth is renown, industrial order with the main worth of efficiency, and a market

1. See, for instance, the open-access journal *Valuation Studies* founded in 2013, which promotes a transdisciplinary debate about valuation. <http://valuationstudies.liu.se/default.asp>.



order of worth where price is the ordering principle. This is not meant to provide an exhaustive list of theoretical possibilities—in practice all orders enter compromises with each other—but to show that the number of arguments through which people can legitimately justify their own actions and positions as well as how they evaluate those of others is always multiple but not infinitely so. Below, I disentangle the main “orders of worth” that were referenced in the situation and that point to an intergenerational conflict about what counts.

With this piece on resource making, I contribute to a strand of scholarship that investigates how natural entities come into being or are pushed out of existence. Steve Shapin and Simon Schaffer (1985) examined the historical processes through which science was given the authority to represent nature (whereas politics was made to speak for humans). Many other STS scholars argued along these lines that natural entities are neither simply found in nature nor are they socially constructed from nothing (for instance, Latour 1987, 1993; Bijker, Hughes, and Pinch 1987; Hacking 1999). Some research focused on “ontological politics” and “ontological conflicts” through which understandings of reality and of natural resources are being shaped and transformed (Mol 1999; Blaser 2009; Cadena 2010).

Anthropological and other approaches since the 1980s have cautioned against taking the specific “resourceness” of what is called a “resource” for granted (for instance, Latour 1987; Mitchell 2009; Richardson and Weszkalnys 2014: 6; Davidov 2014). Rather than conceiving “natural resources” as raw substances in nature, materials with fixed physical and chemical make-up, primordially useful and inherently valuable, such work highlighted the ontological multiplicity of resources and the disputability of what kind of materials with what kinds of properties they are (for instance, Blaser 2009; Behrends 2011; Barry 2013). In this connection, I am also addressing a tendency within Sudan Studies to write about resources as given and unambiguously identifiable entities (i.e., water, land, oil). There is little attention to the mutability and instability of what people conceive as a natural resource and the broader processes through which they come to value it. Rather, sometimes resources are seen as main causes of conflicts, although they are usually not seen as the sole causes (cf. Suliman 1999; Ahmed 2001; Assal 2006).

While natural entities have at least since the 1980s been conceived as products of techno-scientific framings in the field of STS (for instance, Pinch 1986), Martin Heidegger made an earlier contribution that—to my knowledge—was not explicitly referenced in this literature, perhaps both due to his appalling support for nazi ideology and his extreme view of the essence of technology and its politically uncontrollable evolution (Feenberg 2005: 45). For the limited purposes of my argument, I deploy two simple aspects of Heidegger’s take on the relation between technology and its enframing of nature without buying into his whole argument: First, in *Being and time* ([1927] 2009) he coined the concept “readiness-to-hand” (Zuhandenheit) of tools, to underscore that we cannot understand equipment (Zeug) as mere objects toward which cognition is directed. Rather, to comprehend their values and relations they are charged with, we have to consider them in their pragmatic embeddedness in practices. Second, in his late phase marked by his turn (Kehre), Heidegger developed the idea further that the use of modern technology is part of an instrumental enframing (Gestell) with a specific form of valuation: it conceives phenomena such as nature, plants, humans, and animals as mere resources, waiting

to be exploited (in this sense technology denotes the concealing [Verbergen] of being) (Heidegger [1962] 2010). Accordingly, technology is not merely a tool, device, or equipment but part of a mode of ordering that orients all striving toward achieving ends and that transforms how people evaluate objects and relations, as well as present and future circumstances.

I deploy the notion of infrastructure to emphasize that metal detectors with their inscriptions² are of course no standalone technologies able to determine sociality and morality but rather hinge on supporting structures that enable prospecting with these devices.³ Older scholarship on infrastructure established the stability and tenacity of complex arrangements, and their ability to connect and circulate things across large distances as defining marks (Hughes 1983). Whatever arrangement of technologies, procedures, and people was solid enough to facilitate a set of organized practices was called infrastructure in relation to that very practice (Star and Ruhleder 1996: 113; Star 1999). Newer work rather stresses the fluidity, instability, and affectivity of infrastructures and in general tends to focus more on the practice of infrastructuring (for example, Anand 2011; Harvey and Knox 2012; Von Schnitzler 2013; Jensen and Morita 2015). Artisanal gold mining is an interesting and an observable case of infrastructuring: The hard extractive work relies on technologies, knowledge, and specific sites, a certain material-semiotic firmness, to make and move gold. Yet, due to its simultaneous openness and fluidity, this infrastructure of hard-rock gold mining could quickly accommodate a new extractive technology along with emerging forms of moral evaluation. Before I discuss the translation of metal detectors to Sudan, I provide a brief history of the most recent surge of artisanal gold mining in Sudan and sketch my interlocutors' involvement in it.

Mining for gold in northeastern Sudan

Rural populations in Sudan who became involved in artisanal gold mining were not the only ones to rediscover gold. In the midst of economic turmoil due to the loss of oil revenues to South Sudan, the Sudanese government's urgent need for foreign currency revived its interest in gold. It not only signed dozens of concession agreements with foreign investors but also bought gold for export from artisanal miners and prospectors, partially even paying prices in Sudanese currency above the world gold price (Bullion Street 2015; Reuters 2012). The Sudanese government reckons it will be Africa's largest gold exporter by 2018, while acknowledging that

2. Recent work has also often focused on "techno-politics"—the attempt to govern behaviors seemingly apolitically by inscribing normativities, plans, and predictions into technologies (Winner 1986; Akrich 1992: 208). Such inscriptions were also problematized in scholarship dealing with the translation of technologies to different contexts (for instance, Rottenburg 2002; Latour 2005: 223–27; Behrends, Park, and Rottenburg 2014).
3. Instead of deploying the notion of infrastructure, I could have also followed the lead of other authors and could have conceived of these larger arrangements on which technologies depend as large technical systems, assemblages, or networks (for example, Bijker, Hughes, and Pinch 1987; Deleuze and Guattari 1987: 399; Latour 2005).

90 percent of the gold exported stems from artisanal mining (Reuters 2013). These politics are ambivalent in that they set narrow confines upon artisanal gold mining, declaring much of the sector as illegal, while simultaneously promoting its growth by buying artisanal gold at high prices (Calkins and Ille 2014).

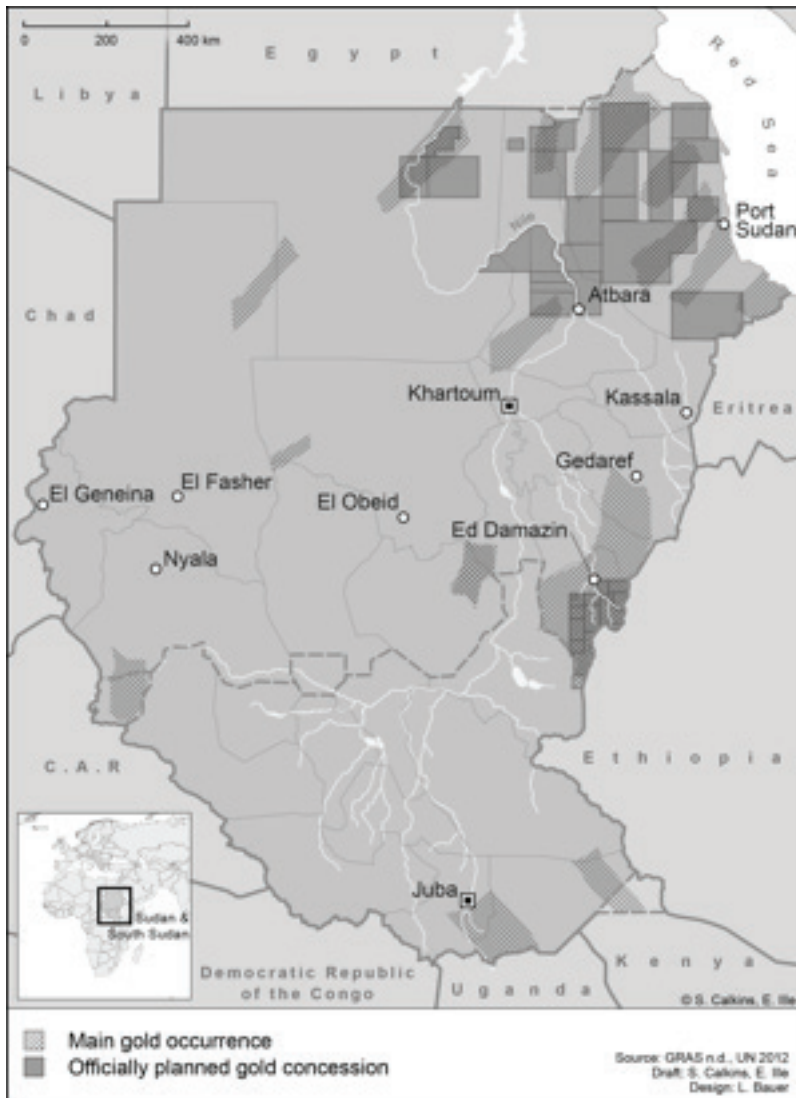


Figure 2: Main areas of gold occurrence in Sudan

While there is a long history of gold exploration in present-day northern Sudan dating back to the ancient pharaohs (Klemm, Klemm, and Murr 2001),⁴ the renewed interest in gold is quite recent. In 2008 only a few thousand participated

4. This area was famed among Arab adventures in the ninth century as “the land of the mines”; colonial powers likewise sought to set up mining industries (Holt and Daly 2000: 14), but until very recently there was only one producing industrial mine in Sudan.

in gold mining, in early 2015 it was estimated to involve up to 750,000 people.⁵ In 2009, most of the male interlocutors from a small poverty-stricken settlement in northeastern Sudan, where I had done research intermittently between 2007 and 2010, had given up pastoralism and small farming to become artisanal gold miners. The settlement's growth is related to the expansion of artisanal gold mining in the vicinity. It is a place where miners left their families behind and travelled to and fro to the mines, the latter being a purely male space in northeastern Sudan, where gold-bearing ores are cut out of the underground rock. The by far largest number of men in the settlement was working underground in mines or was involved in the artisanal gold processing industries. However, since late 2009 more became involved in prospecting the surface with metal detectors for another type of resource—clean gold.

Anthropological studies have frequently pointed out how local economies resisted or limited the integration of money that had to be ritually purified to become part of established normative and symbolic orders. Also, gold money is often considered illicit and suggests the uncanny involvement of spirit creatures because it was not gained by hard and honest labor. It is associated with such notions as “bitterness” in Kenya and Burkina Faso (Shipton 1989: 37; Werthmann 2009: 159ff), or “heat” and has to be spent as quickly as it was gained on Sumatra (Znoj 1998). In Sierra Leone, money from diamond mining is similarly called “fast money” and it tends to be connected with greed, a lack of solidarity, and raises the suspicion of having generated it through demonic help (D'Angelo 2014). Sapphire mining in Madagascar similarly yields “hot money” that young men spend quickly and lavishly without foresight in an act of resistance against their socioeconomic marginalization (Walsh 2003: 291). In view of this literature that documents the tension between new mining-related forms of wealth and existing moral orders, it is noteworthy that among my interlocutors “clean gold” was clean in a spiritual sense too: Finding it was connected to an Islamic God and an innocent piece of mining technology; it did not bear negative connotations but could be used freely and was invested in all sorts of business. Some bought livestock, others built houses, walls around their property, again others invested in cars or pooled their money to invest in another metal detector.

But is clean gold really a new resource category? Did people not find it before the detectors proliferated in Sudan? Alluvial deposits—the same matter that emerged as clean gold in northeastern Sudan—in sand, clay, and silt are historically exploited through panning or using sluices (Launay 1908: 8–55). My interlocutors, however, who mostly started to search for gold in 2009, were not familiar with more conventional extractive procedures. Before the introduction of metal detectors, they only knew gold that was laboriously mined from hard-rock ores. Thus, in view of this hybrid nature of gold mixed into rocks, they referred to detector-found gold as clean gold, denoting its purity, without ever mentioning or, to my knowledge, applying other techniques.⁶ Therefore, clean gold as a resource and the soil as

5. See Bullion Street (2015), which quotes the Sudanese Ministry of Minerals.

6. See footnote 3 also. Most mining operations employ hard-rock mining to extract gold from ores. Officials of the Geological Research Authority of Sudan (GRAS) showed me



its deposit recently came to matter in the flow of this technological activity. With this case study of a piece of mining technology, I also add to recent anthropological scholarship that has sought to transcend what Ricardo Godoy (1985) criticized as the anthropological self-restriction to the social context of gold mining⁷ that implied leaving the technological-geological infrastructures for other disciplines to study.

In the settlement where I did fieldwork everyone was talking about gold, dreaming of new wealth and prosperity. Even before the onset of mining, gold had a high value among the Rashaida I met. Gold signified divine blessing, prosperity, and fertility.⁸ Yet, in view of rapid socioeconomic changes, there was much uncertainty in this part of Sudan concerning which established values were still able to offer orientation in these new circumstances; normativities seemed in flux and were constantly overhauled. Young miners I talked to often dreamed about a lucky strike, that God-willing they would find cars, stone houses, or new wives in the soil; their wives would then often add that they would rather get gold jewelry or a herd of goats than a cowife. What marked these dreams was that they aspired to distinctively individualistic futures, even if actual extractive practices enacted new forms of cooperation, as I will explain below.

Translating the technology

Detectors were developed in connection with radiotelephony beginning in the late nineteenth century, but soon the technology was adapted to different fields of activity, such as mineral prospection and archeology. Importantly for its rapid development, it was used in military operations to detect land and antitank mines; later it was also applied industrially to detect metal supports in building and flaws in underground pipes (Collins 1902; Henney and Markus 1946; Connor and Scott 1998). The favorite model used by my Sudanese interlocutors in 2009 and 2010 was the GPX 4500. According to its Australian manufacturer, Minelab, this metal detector was developed for hobby gold prospectors. One established scientific hypothesis about seismic activity in the earth's history contends that fluid metal was formed at great heat underground and then was dispersed through tectonic events, in part ending as gold flakes, grains, or nuggets in the top soil layers (Launay 1908). The detector is designed to find such gold lumps in the near surface layer of the soil. But we need not assume that the specificity of these materials can be grasped

maps, locating alluvial deposits in Blue Nile State and South Sudan—not in northeastern Sudan. Enrico Ille (2011) indicates that panning was employed in South Kordofan.

7. Tilo Grätz (2010), for instance, described not only norms and social organization of gold mining in Benin but also analyzed mining technologies, tools, and the bodily performance of extraction.
8. There was an expectation that a groom presents gold jewelry to his bride at marriage; women washed themselves over gold jewelry to treat infertility; and older women said they formerly used it to store wealth but meanwhile often had to sell it. Women who were seldom able to read or write could recount exact prices not only for their own jewelry but also for that of an astounding number of neighbors and relatives.

solely in the terms of earth science. Rather, the properties and values of clean gold are locally made in interaction with other materials, such as the metal detector, and significations specific to the mining sector in northeastern Sudan.

The metal detector's coil is connected to a check box and a battery, which electrically induces a magnetic field. When the coil is moved across the ground and encounters a metal, such as gold, it reacts. An electromagnetic current emerges between the metal and detector's magnetic field, changing the detector's field. This change is signaled acoustically. The pitch and volume of sounds that the detector emits varies, allowing one to distinguish metal objects from ground noise or electromagnetic inferences. Experienced prospectors begin to "hear the gold," it is said among the prospectors in the Lower Atbara area. More abstractly, the detector translates complex underground composites according to a metal/nonmetal code into sounds (and graphics on the LCD display).

Perceptions of the metal detector's properties and its correct usage have to be adapted to Sudanese specificities, which shape both the use of this technology and what "clean gold" is taken to be (see Beck 2004 on the adaptation of Bedford trucks to Sudan). The metal detector was designed with three different modes of search adjusted to different soil types, which demand different bodily movements. Prospectors I met conceived the detector as being endowed with a stable property of detecting metals at a depth of about one meter and their movements across the ground incorporated imaginations of the form, structure, and location of the objects sought after—clean gold. While reading manuals of technical devices is probably not done thoroughly anywhere in the world, the limited reading skills of most of my interlocutors restricted them to learning by participating with and observing other prospectors.

The GPX 4500 not only anticipates a literate user but also one that can work on his own. The ideal range for operating the battery, for instance, lies between 5 and 25°C. To limit the risk of electronic damage through overheating in Sudan, where temperatures regularly exceed 40°C, prospectors from the settlement worked mainly at night, demanding at least two prospectors—one to hold the flash light (and carry the shovel), one to hold the detector. The need to recharge the battery every few hours via an adapter in the car fostered a high nocturnal mobility of detector teams, which move unseen and unheard from site to site.

In northeastern Sudan, artisanal detector prospection is not recognized as a merely technically mediated activity, rather, the idea of clean gold in the Sudanese artisanal mining sector takes recourse to an imaginary of divine ordination. This perhaps most consequential translation of the detector concerns the kind of properties the resource in question is endowed with. Many I talked to like Hussein imagined a divine being, an Islamic God, who was held with planting the nuggets in the ground for certain ordained prospectors. Prospectors reasoned that certainly the detector was needed to find gold, but without a provisioning God the device could not lead to any profits. The technology was interpreted as a tool to pursue "what God had written down" for a person, to claim one's divinely apportioned share. Yet, doing so, claiming one's proper share and one's destiny was seen as everyone's own responsibility, a responsibility fulfilled by testing one's luck (*hazz*). Therefore, clean gold is not an isolated precious metal out there in the ground nor is it what miners created in their imagination. It is made in and through material-semantic



work, involving skilled bodily performances, technologies, their scripts, and their translation in terms of an ordaining God.

Reconfiguring moral orders

The making of clean gold provides a glimpse into the ongoing negotiation of normative orders in Sudan. I identify two conflicting moral orders—an emerging order that prizes individual profit and luck while forming new kinds of social bonds between prospecting teams, and an established moral order that prioritizes hierarchical relationships between senior men and their dependents.

Let's return to unlucky Hussein. Moved by the recalled story of sensational finds in places taken-for-granted and thus far unexplored, he got the idea to prospect in his immediate neighborhood. Not only did he hold the idea of finding much clean gold in his mind but he also enacted it bodily. The metal detector he was using tempted him to frame the soil in the settlement as resource reservoir waiting for exploitation, something he had not conceived before. This resonates with Heidegger's point that the use of modern technology with its instrumental logic conceives phenomena such as nature, plants, humans, and animals as mere resources, as “standing reserve” (Bestand) waiting to be exploited (Heidegger 2009: 100).⁹ This observation of the enframing of everything in terms of economic use was part of Heidegger's technology critical turn in 1960 (Kehre) and his main point was that it conceals being (Sein) (Heidegger 2010: 103–5).¹⁰ The use of metal detectors converted the soil into a “standing reserve,” a mineral deposit for prospectors, while concealing other ways of imagining and using gold and the soil that contains it, in effect orienting all doing to a restricted sense of economic utility.

Prospecting for clean gold with metal detectors is a case in point for this economic enframing. This economic valuation is also apparent in the fact that artisanal gold prospectors I met talked about clean gold in terms of the monetary equivalent this fetched them. While not being aware of the exact world price per gram of gold, miners were aware of the increasing prices that middlemen and traders were willing to pay for gold, mirroring the rise of the world gold price from roughly US\$250 per ounce in the early 2000s to \$US1,000 in 2008, peaking at \$US1,900 in 2011.¹¹ But the monetary equivalent of gold is of course not the only value at play.

Rather, a compromise was formed between this economic order of worth and an “inspired order of worth” that prized qualities such as creativity, grace, and uniqueness (Boltanski and Thévenot 2006: 159–64). Successful prospectors referred to

9. This observation was already made in *Being and time* (Heidegger 2009), originally published in 1927 as *Sein und Zeit* in Tübingen (Max Niemeyer Verlag) that appeared in 2006 in its 19th edition.

10. The essay *The question concerning technology* was originally published in 1962 as *Die Technik und die Kehre* (Pfullingen: Neske).

11. It has since decreased to \$US1,600 in 2014; see the interactive price chart on the World Gold Council 2015. Accessed March 5, 2015. <http://www.gold.org/investment/interactive-gold-price-chart>.

intuition or divine inspiration as the causal force that made them search in specific locations. Ideas of luck, fate, and divine predestination were used to make sense of why some found such gold lumps or come across an underground gold vein, while others failed to. Explorers like Hussein conceived their personal entitlement to extract clean gold as emanating from this understanding of divine ordination, even if nuggets were found on spaces owned by other people, spaces formerly used collectively for herding or rain-fed cultivation, or contracted according to a governmental concession. Importantly, clean gold came to be interpreted as a resource divinely bestowed upon an individual, who nonetheless had to exert himself to pursue it.

Yet, the organization of extractive work in Sudan demanded subjecting what God has prepared for a deserving individual to other considerations, such as safety, trust, and new expressions of reciprocity. The introduction of metal detectors not only brought about a new resource subcategory and associated valuations but also led to the growth of a segment of artisanal gold mining with its own forms of social organization and normativities that among Rashaida challenged the previous patriarchal authority that was associated with pastoral livestock production. Men engaged in gold prospecting were called “*ahl al-jihāz*” (the detector’s people). Owners of detectors—or, those representing a group of owners like Hussein—have emerged as a new group of entrepreneurs, set apart from mere workers on detecting teams. Almost all owners among Rashaida I met were young and respected men, usually former labor migrants to the Gulf with some money at their disposal. They were crucial in instigating prospecting: they mobilized the money to buy these expensive devices, which in 2009 and early 2010 could cost up to EUR 10,000 on the Sudanese black market; they took a risk in buying these contraband goods; they acquired specific know-how to operate the device, transmitted it, and monitored the use of the device; they organized the extractive enterprise, that is, the duration of shifts, the composition of the team, its mobility, and they calculated and accounted for who got which share of the revenues.

Since prospecting mainly happened at night and involved traveling to isolated deserts and mountainous areas, work was done in teams. Returns were shared according to clear distributive rules: owners of the detector received a third, owners of the car another third, and the group of workers received the last third. This clear distributive arrangement thus contradicts the imaginary that a preordaining God would prepare gold nuggets in the ground for certain deserving individuals because a worker’s divine gift had to be shared with the prospecting team and even unequally with the group of owners. The individual’s divinely ordained luck was thus celebrated but in reality translated into the team’s luck. I noticed that every member of the mining team was well informed about the grams of gold found, the price this fetched, and the different shares of the money earned. On returning from a mining trip, miners usually first reported on exact figures and these figures circulated in the settlement when neighbors visited each other or women chatted over coffee. There is some tension between keeping track of the exact figures and the emphasis prospectors placed on trust and loyalty founded in kinship.

The explicit logic guiding the composition of detector teams was to promote the welfare of kin and at the same time to employ people who could be trusted, creating another sociality than hard-rock mining, where teams were composed of



people from diverse religious and ethnic backgrounds (Calkins 2016: 138). With the authority to decide on the composition of detector teams and the schedules of extraction, owners had become nodal points in their social networks that individual workers had to pass to join the work. By taking different people along in successive rounds, these new entrepreneurs were able to create more long-term relationships, creating networks of indebted kin. Owners were held responsible for being inclusive, fair, treating all paternal kin equally, and for being generous during the mining trips, while workers were expected to reciprocate in terms of loyalty. The emerging sociality in prospecting took the shape of patron-client relationships, whereby a new and younger group of men emerged as patrons in their kin networks.

Challenging seniority

A new quality of these ties lies in their exclusion of the older generation, the patriarchs, who formerly commanded livestock and meanwhile often had become dependent upon their sons for their livelihoods. This process had already started in the late 1980s when young men began to migrate to the Gulf States and earned incomes that made them independent from their fathers. Yet, some older men complained to me that their sons kept the money from gold mining to themselves; I never heard this complaint about labor migrants in the Gulf who also saved money for their own investments (while distributing some of it among their kin in times of need). The money from gold mining was special in that it was nearby in their sons' pockets, was spent on tangible material items, and they knew how much they had earned since everyone memorized the exact figures. While older men at times overlooked the new redistributive mechanisms that emerged in detector prospecting, they expressed a feeling of being sidelined by this intergenerational shift of control over an important equipment. As in many Muslim societies, I noted that seniority still has a high value among Rashaida: senior men were addressed respectfully, received food first and the best pieces, and they were also offered the most eminent places to sit.

This underlying intergenerational value conflict may explain older men's outrage at Hussein's act. Hussein was the only one who to my knowledge had tried to prospect in the settlement. It was a random, renegade act that expressed uncertainty about what counts in the situation. His act can be interpreted not only as a test of his luck, as he noted, but as a test of normative orders: could the economic enframing of detector prospecting—clean gold and land as reservoir of subterranean matter—also be pertinent in the settlement?

He received a clear answer. “That this is not right,” some of the neighboring women commented on Hussein's prospecting. Older men I talked to objected to Hussein's act as brazen and disrespectful, lacking the proper modesty (*hišma*). *hišma* means propriety, humility, modesty, and shame. In an ethnographic study of Rashaida marriages in the 1980s, William Young found that *hišma* referred to hierarchical relationships between a nomadic camp's senior man and camp members and was the defining norm of camp sociality—not kinship, descent, or affinity. Camp members were expected to be respectful of the senior man and to avoid

harming his reputation; he reciprocated for *ḥiṣma* by providing to camp members benefits, such as security, access to jointly used water and pasture resources, and labor power through herding collectives (Young 1988: 128–32, 136). Older men still entertain the expectation that younger men display *ḥiṣma*, while due to new economic circumstances often are unable to reciprocate accordingly (Calkins 2016: 99).

ḥiṣma coincides with what Boltanski and Thévenot (2006: 164ff) refer to as a “domestic order of worth,” an orientation toward tradition and seniority, where entities are being ranked and organized based on their position in personal relationships to senior men. It is this order of worth of the past that is being challenged by the compromise between moral horizons of divine ordination and profit seeking articulated in gold mining, even though many of these younger men have become new patrons themselves. Hussein, however, was neither the independent and wealthy labor migrant nor detector owner but a respected schoolteacher and someone who only through his father gained access to such a preeminent position as so-called *wakīl* (trustee) over a detector; still, his act was seen as reflecting the attitudes of a younger generation that tried to use this new equipment inappropriately to renegotiate the balance of generations. While feeling challenged and even disempowered by a younger generation of men who with money control an even more fugacious capital than livestock, they successfully thwarted this young man’s prospection and confirmed moral authority of older men over doings—at least in the settlement.

Outside of the settlement in the steppes of northeastern Sudan, there were also tensions about land use for gold mining:¹² Official frameworks for resource governance, resident groups, hard-rock miners, detector prospectors, and environmental conservationists claimed contradictory but overlapping versions of reality. These different versions of reality acknowledged different causalities for the occurrence of gold—divine intervention or seismic folding—and prioritized different normativities that mainly confirmed the economic value of gold but also unearthed incommensurabilities with further value ideas. For example, artisanal hard-rock mining spread across vast areas, devaluating the landscape for farming or herding through hundreds of mines, pits, and mounds of dirt; resident groups claimed an attachment to land as ancestral home and longstanding farming and pastureland, demanding compensation from miners; artisanal hard-rock miners mostly cooperated with customary land owners, though still seeing their revenues as divinely foreordained; mobile detector groups—moving unseen at night—tended to disregard land ownership, seeing land as a resource-base and access to it justified by divine ordination; governmental planners often mapped the same spaces as unused governmental land in official geophysical surveys or as part of concession agreements with investors; enterprises in mining valued only land with reserves that merit industrial extraction, ignoring scattered clean gold.

12. See Calkins and Ille (2014). Land use in Sudan is subject to various overlapping institutions, such as customary law, state law, or pasture agreements between farmers and herders. Mineral resources, as in most countries, are again subject to other legislation and other governmental competences.



Figure 3: Open pit mining near Wadi al-Ushar

Infrastructuring clean gold

Clean gold (*dahab ṣāfi*) does not emerge merely from the interplay of individual gold prospectors, metal detectors, the physical environment, and a social imaginary of divine ordination. Rather, resource making occurs in larger arrangements, I call them infrastructures here, which allow the circulation of values and at the same time are remade by those values.¹³ Clean gold in particular relied on the infrastructure that had emerged around hard-rock mining.

Classic scholarship has mainly attended to the recalcitrance of infrastructures, the stability of their standards and classifications, the ways in which their materiality exerts a largely invisible constraint upon certain human practices and precisely thereby also enables them. To some, the term infrastructure implied prioritizing the material world over the social, suggesting that infrastructures form the stable material base that shapes significations and moral worlds, yet they certainly were

13. For example, I could have also focused on how practices of gold extraction in rural Sudan are linked to infrastructures of international trade and financial institutions as well as national governmental bodies. Extracted, processed, and partially refined in Sudan, regulated and marketed by the government of Sudan, by investors, international-standard setting bodies and gold industry groups the substance becomes a globally-esteemed commodity, whose quality and worth can be measured in line with the world gold price. Or I could have explored how the exchange rates of three currencies (US dollar, Pound Sterling, Euro) are involved in establishing the gold price for the global market. See The London Bullion Market. Pricing and Statistics at <http://www.lbma.org.uk/pricing-and-statistics>, accessed February 18, 2015.

aware of the bidirectionality of this process. Bruno Latour (1996: 235), for instance, explained that he mobilized the term network instead of infrastructure to shift attention from the firmness to the fluidity of infrastructures. Recent scholarship uses the term infrastructure in a way that is very similar to Latour's network and focuses more on the doing of infrastructure (see Larkin 2013 for an overview). The conceptual shift from infrastructure to infrastructuring highlights the always incomplete process of making infrastructure and the continuous work at integrating, cutting, and maintaining relations between heterogeneous elements; infrastructuring means organizing social practices (Niewöhner 2015: 123). In this sense my case study deploys the concept of infrastructuring to concentrate specifically on the integration of a new extractive technology and situate it into a longer established practice of gold extraction from hard-rock ores that in turn implies gold processing facilities, the emergence of markets near the gold mines, and a heterogeneous lot of gold miners and moral ideas.

In Sudan, some infrastructural projects such as road construction, the large hydro-dam projects along the Nile, or the opening of a gold refinery in Khartoum in 2012, have a high public visibility and are celebrated by the government as portents of progress and modernity (Verhoeven 2011; cf. Harvey and Knox 2012; Mains 2012). Unlike public infrastructures, such as sewers, roads, or dams for electrification, which are developed to serve citizens, the arrangements that facilitate artisanal gold mining are largely unobserved and this turns them into a productive case. They are principally illegal, though in practice many activities are condoned. Governmental planning and stipulations do not explicitly promote them; rather, they grow from below through people seeking their luck and wanting to do business. While some elements like mines and market stalls materialize on fixed and bounded physical locations, infrastructuring is ongoing. The technologies, people, and things are constantly in flux, emerging somewhere else, moving with the most productive mining sites. They are neither very stable nor entirely sunk into the background of human doing, as power or telecommunication infrastructures might be. Rather, most elements are visible and visibly unstable, shifting from high productivity to the typical abandoned ghost towns.

The infrastructure that expanded with the emergence of clean gold and the integration of metal detectors is the arrangement that grew to enable hard-rock mining. No one knew of gold when I first visited the area in 2007. When I returned in 2008, a few men from the settlement where I stayed had become gold miners extracting hard-rock ores. Between late 2008 and early 2009, pits and mounds of dirt proliferated in the vicinity as mines were being dug. Heavy machinery was soon brought to the artisanal mining sites to extract rocks from gold-bearing ores; tractors, bulldozers, pumps, diesel-generators to operate pumps, and diesel-run grinding machines to pulverize gold ore. In the course of 2009, thousands of people, often the rural poor, streamed to the gold mines in Wadi al-ʿUshar. Thus, when I returned to the area in autumn 2009 for more fieldwork, nearly all of the men from the settlement were engaged in gold mining.

Unlike the extraction of clean gold with metal detectors, hard-rock mining depends upon labor-intensive facilities to process the gold from the stones, that is, cutting it out from underground rocks, breaking it to pieces, grinding it to powder, washing it with mercury to form an amalgam, burning the amalgam to release the

mercury and end up with a gold lump of variant purity. A large and busy settlement of makeshift tents and huts organized around the facilities had developed in Wadi al-^cUshar, where miners were busy processing their ores, which I visited a number of times in late 2009 and early 2010. The market had also turned into a new center for supply, amusement, and consumption, stocked with goods otherwise unavailable in the impoverished hinterlands of the Lower Atbara area. All detector people I met visited such gold markets to assess and sell their pure gold nuggets, to stock up their supplies and to find spare parts for their cars. Furthermore, some electricians and mechanics had specialized in repairing metal detectors and had opened shops at the main gold markets. On the fringes, there was a service industry, selling tires, gasoline, and mining gear, such as headlight, pickaxes, shovels, hammers, clothing, and much more. While the size of the settlement in the middle of nowhere was surprising, it did not emerge to stay. In early 2010, a second smaller settlement grew 20km further north, and, in March 2010, I witnessed an intermediate decline when many relocated to another new mining site farther south.



Figure 4: Abandoned market stall in Wadi al-^cUshar

Whereas prospecting with metal detectors reconfigured artisanal gold mining by creating a new substance—clean gold—new sites, valuations, and social categories in Sudan, it hinged on something that was already there. This was an archive of regional expertise to know, identify, detect, process, sell, and market gold from hard-rock ores. There also was an established Islamic understanding of *rizq* as the God-given entitlement to livelihood and, importantly, ideas about luck, fate, and divine predestination were at hand in northeastern Sudan that could be used

to make sense of the haphazard nature of gold mining. These understandings of divine purpose and ordination together with this archive of expertise were part of the infrastructure of artisanal gold mining that reconfigured with the introduction of metal detectors and the new political economy of formerly oil-dependent Sudan. This ongoing infrastructuring enabled clean gold to emerge as something valuable in the eyes of artisanal miners, who had to invest much money in buying metal detectors and would not have done so without the promise of rich returns.

Conclusions

What is gained by a detailed examination of how clean gold came to matter as a resource in Sudan? The presented case sensitizes to processes of translation beyond the ethnographic specificities, to how what is of value is situationally reconfigured. The subterranean matter in question, clean gold, cannot be disassociated from the technology developed to find it, from theories concerning where such gold may be scattered, from conjecturing infrastructures that enable the extractive practice and the movement of gold, and are reconfigured by it, and also not from ideas concerning what it is about the substance that is of interest. These established infrastructures make the mining endeavor—or, in this case, the operation of the metal detectors—sensible, realizable, and worthwhile and participates in bringing this resource (sub)category into being.

The prospector does not find mineral resources in a subterranean, pristine form, detached from a number of underpinnings. Rather, they are related to an environment that is invested or equipped with specific features. For example, containing gold along riverbeds, in the top layers of the soil, or in variant associations with rocks, such as quartz, granite, or barite, an environment that is surveyed and mapped by governmental authorities.¹⁴ Or that is parceled into concession for international investors, where global markets for gold exists and stipulate high prices in hard currency, and where travelling detectors can function properly only if God has planted nuggets for adventurers, and when human bodies move in the right rhythm to “hear the gold.”

The expansion of the extractive practices to prospecting with metal detectors is an ongoing case of infrastructuring. The metal detecting devices as innovations hinged on the established infrastructure of artisanal hard-rock gold mining with its technologies, sites, expertise, and moral ideas, and reconfigured it at the same time. This infrastructuring enabled the circulation of religious significations that were assembled by a younger generation of men into new forms of moral evaluation. These devices and the emerging social relationships around clean gold have become a useful tool for a younger generation of men, who formerly were disenfranchised from economic resources and depended on their fathers, to challenge the paternal authority and the moral orders they promote. Clean gold is not only an economic resource that gives more agency to the mostly young prospectors. I suggest that it may also be seen as “clean” in a sense beyond its extraction: It enabled young men with access to metal detectors to increase their range of agency in relation to their

14. According to maps and officials I interviewed at GRAS, gold can be found mainly in quartz veins, located in four main gold belts.



fathers without directly confronting their authority. This is part of another order of evaluation that challenges the prioritizing of tradition and relations to seniors and rather prizes an individual's industriousness and making money but combines this with ideas of divine grace and ordination. Contradictions between these incommensurable “orders of worth” have not been worked out, although tradition beat individual gain in the discussed situation.

I sought to draw attention to social ordering in a situation of transformation, where competing normativities relate to gold and its extraction. The metal detector in Sudanese artisanal gold mining is inscribed with certain properties and values, such as a notion of independent personhood, which affects how gold prospecting is organized and performed. The technology enables enframing the environment so that new values can be produced, but it is more of a subaltern technology, smuggled into the country and used to resist a discriminatory resource politics of the center. Furthermore, value is made through a continuously expanding infrastructure. It is not stable but constantly moving, not public but informally emerging; it is tolerated not legalized. Yet, it is through this ongoing infrastructuring that materials and values are made and marketed. The value circulating in these infrastructures may be “enchanted” in ways that differ from suggestions made by Penny Harvey and Hannah Knox (2012): dreams of prospectors in Sudan do not connect to a nation's progress through modernization and civic participation but are fed by individual desires for wealth and prosperity. Empowered by the imaginary of a divine casting out of lots, it encourages a sort of image of the entrepreneurial figure of the prospector, who appears to be freed from normative constraints that normally weigh upon his engagements with land owned by others. Subterranean matter in this view is open to private exploration, a view that Hussein promoted. Yet, he was corrected. It was not only this young man's enframing of land as a resource for his own gain that appalled people but also his taking the imaginary of divine ordination too literal in a setting where private gain of a younger generation of men still has to be connected to wider distributive mechanisms among kin.

A pragmatist approach to a particular resource inquires into the making of resources, the mutability of how value is attached, and how this affects how claims can be made, maintained, or refuted. This can help to move away from dramatized perceptions of natural resources as being “essential” for human existence and “scarce” and to question what makes them interesting. It opens up a space for investigating how people test whether something is of worth as well as how they align or revise different values.

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De l'importance prise par l'or “propre”: Détecteurs de métaux, infrastructure et évaluation

Résumé : Récemment, une ancienne ressource, l'or, a acquis une importance nouvelle au Soudan. Afin de comprendre l'émergence des valeurs d'échange et leur négociation en période de réorientation de l'économie nationale, je m'intéresse à l'émergence d'une nouvelle catégorie de ressource, ce qu'on appelle l'or propre, et je suggère que ce développement est lié à l'introduction d'une nouvelle technologie de recherche: les détecteurs de métaux. Je rapporte l'importance prise par les détecteurs de métaux au Soudan et leur rapport à l'infrastructure techno-économique de l'exploitation minière artisanale de l'or, qui donne lieu à l'exploitation de l'or en elle-même mais aussi à la circulation de nouveaux raisonnements moraux. Non seulement une nouvelle catégorie de ressource s'est développée, mais ces technologies et les mondes moraux qu'elles ont constitué ont permis à de jeunes hommes de tester et d'interroger l'autorité morale et économique des générations d'hommes plus âgées.

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