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FABRICATING THE INTEGRITY OF GOLD IN REFINERIES

Digital Visibility and Divisibility

Matthieu Bolay

Abstract

Gold refineries are under pressure to revise their understanding of “integrity” beyond the physical cohesion of gold products, in order to integrate supply chain due diligence on human rights, labour conditions, and conflict financing as part of what can be coined the ethical integrity of gold. This article interrogates how processes of erasure, through material purification in the refining process, and disclosure, through certification against “responsible” standards, are reconciled within one expanded notion of integrity. By paying specific attention to processes of digitizing gold in this endeavour (blockchain and ICO), it argues that, while limited in its role as a transparency device, digitization fosters new uses of gold, making it more liquid, more rapidly tradable, and potentially more speculative. These digital fetishes open new fields of value, not out of the gold itself but out of its traces, in which, paradoxically, artisanal ground producers selling physical gold remain poorly included so far.

Keywords: *responsible supply chains, integrity, gold refining, blockchain, digital fetishism*

Introduction

Our mission is to ensure the highest levels of leadership, integrity and transparency for the global precious metal industry by setting standards and developing market services. (LBMA Mission statement)

In an interview conducted in 2018, an executive of a Swiss gold refinery noted that

the industry has changed a lot in a very short time span. As refiners, our role has always been to guarantee the integrity of refined gold to build trust for the industries who trade it. For long, this meant achieving the GDL [Good Delivery List] standards¹ in terms of assaying, cast, marking, size and appearance, as well as our internal management. (...) But with

¹ The Good Delivery List is the list of refiners accredited by the London Bullion Market Association (LBMA), the refining industry association, to trade in the London market.

increasing demand for compliance and supply chain due diligence on human rights, we have had a lot to do with the responsible gold guidance [which the London Bullion Market Association (LBMA) made mandatory since 2012]. Still now, it's nothing easy.

And, as if anticipating a possible critique, he also added that “Maybe it’s true we were a bit late, and that we were not very prepared for that.”

Along with the rise of consumers’ concerns for ethical products and the risk of transnational embargos on so-called “blood” or “conflict minerals” (Jacka 2018), gold refineries have also had to revise their understanding of “integrity.” This new understanding of integrity, a central notion in this industry said to be the choke point between extractive industries and the sectors of jewellery, finance, and central banks, should be expanded beyond the physical cohesion of gold products, in order to integrate supply chain due diligence on human rights, labour conditions, and conflict financing as part of what can be coined the ethical integrity of gold. As the chief executive of the LBMA put it in a public statement, “Not only does gold have to be gold, but it also has to be responsible” (Crowell 2016, 6). This line of discourse suggests that the industry should be held equally accountable for the “sociality” of gold (Law and Mol 1995), as it constitutes an integral part of the material’s value that should be made visible and legible, just like its physico-chemical qualities of elemental purity. Within this newly defined “zone of qualification” (Barry 2006, 240), rather than only ensuring the “true nature” of the gold processed against counterfeits and standardizing its form and purity to make it commensurable with monetary concerns, as was historically their role (Vilar 1974; Green and Murray 2011), refiners are now expected to act as the international market’s barriers against flows deemed illicit or not compliant with human rights, as defined by the OECD Guidance for Responsible Mineral Supply Chains (OECD 2016).²

Based on this dual understanding of “integrity,” both physical and ethical, this article asks what qualities are produced, retained, or concealed to achieve the integrity of gold, as well as the role of digitally mediated technologies in this endeavour. In particular, it interrogates how processes of erasure, through material purification in the gold refining process, and disclosure, through certification against “responsible” standards, are reconciled within one expanded notion of integrity. The article thus tracks the fabrication of gold’s integrity and the practices developed to achieve it in the selective compartmentalization and (in)visibility of the social life of refined gold on the one hand, and the hybrid imbrication of mineral and digital materialities on the other. In doing so, it asks two questions. First, how is the possibly contentious ethical biography of gold mediated to enter the zone of licit and legitimate international trade? Answering this question not only implies paying attention to the materiality of gold, but also looking at the way gold goes beyond its identity as a resource to be mined (Richardson and Weszkalnys 2014) to become both a commodity and a financial asset – a double and ambiguous status already noted by Marx, who saw gold as the ultimate “money-

² The OECD (Organisation for Economic Co-operation and Development) Due Diligence Guidance for Responsible Mineral Supply Chains was launched in 2011 and became the blueprint for most “responsible” certification schemes in the extractive industries. It sets a five steps framework for due diligence on minerals from “conflict-affected” and “high risk” areas, amongst which the largely informal sector of artisanal mining is a main focus because of its association with various forms of exploitation.

commodity" (Marx 1976 [1867], 188). This analysis will depict the socio-material procedures of gold purification proper to the refining process, and it will delve into the techniques and legal categories on which refiners rely to address issues of security and integrity. I will pay specific attention to gold mined artisanally, for which concerns of ethical integrity are particularly salient. The discussion will mostly follow Switzerland's legal categories, a country through which 70% of gold is estimated to transit.³ Second, the article will question how gold's physical and ethical qualities, and underlying processes of erasure and disclosure, are assembled. To do so, I will focus on emerging trends of digitizing gold and traces of its trajectory in a zone of qualification deemed "responsible" and accountable for the social relations underpinning the extraction and trade of gold. This endeavour implies considering what Appadurai famously termed the "social life of things" (1988), which acknowledges that commodities are not "inert and mute, [but] set in motion and animated (...) by persons and their words" (Appadurai 1988, 4). Such a view of "things," according to Appadurai, empirically actualizes one of the intuitions that underlaid Marx's famous discussion of the "fetishism of commodities," that is the masking of relations between people as relations between things. In making his argument, Appadurai advocates for a minimum level of "methodological fetishism" whereby only "human transactions and calculations enliven things" (1988, 5), which reinforces dichotomies between material and social orders. However, gold is a naturally occurring substance that has been entangled in techno-economic networks throughout history and in contemporary times; this entanglement, which constantly recalls its status of hybrid agent (Field 2019; Ferry 2020), will be discussed below.

Therefore, I take inspiration from works in science and technology studies (e. g. Callon 1991; Latour 1991; Latour 2006) to describe this endeavour of tracing and digitally "inscribing" gold's qualities, acquired along its journey, as new "irreversibilities" (Callon 1991, 150). According to Callon (1991, 150), irreversibilities suggest mediation processes which render "impossible to go back to a point where [ascribed qualities] were some amongst others". In the first half of the article, the analysis helps to show how certain qualities are stabilized, while others are concealed, in the making of the material's integrity. It questions the extent to which such irreversibilities contribute to the making of new fetishes, as has been argued for fair and ethical schemes for instance (Hudson and Hudson 2003). In the second half, I seek to go beyond assumptions of "green-" or "bluewashing," in order to look at the new forms, uses, and valuation of gold that this impetus for digital traceability produces. Before moving forward, the article gives a brief discussion on the dual meanings of integrity and purification, followed by a definition of what a refinery is and does in light of its role of "mediator" to the licit zone of the gold trade (Latour 2006, 58).

To do so, I rely on interviews with executives and technicians from nine refineries located in Switzerland, the UK, Dubai, and Mali (visits were conducted in the two malian refineries only), as well as with policy advisors and providers of digital traceability and compliance technologies.⁴ I also mobilize long standing ethnographic research among artisanal miners and gold traders in West Africa. Finally, I attended industry events, workshops, and webi-

³ https://www.swissinfo.ch/fre/m%C3%A9taux-pr%C3%A9cieux_la-suisse--carrefour-de-l-or/33666468, accessed 2nd February 2021.

⁴ I conducted 38 formal and informal interviews in Switzerland, the UK, France, Germany, Mali, and Guinea.

nars, during which not only compliance officers and CSR executives – the public face of the industry – but also engineers and technicians participated and debated technical options.

Purification and integrity

Refining lies at the junction of the so-called “upstream” or production, and the “downstream” or consumption and trade of the gold supply chain.⁵ Technically, gold refineries proceed with the material purification of gold from impurities, that is any other chemical element than Au (gold), up to a fineness of 99.99 percent, as is the so-called four “9” standard for gold bars. Subsequently, refineries act as socio-legal guarantors of the integrity of the bars they produce for the gold market.

Both “purification” and “integrity” have dual and converging meanings. Purification is defined in the Oxford dictionary as “the act of removing substances that are dirty, harmful or not wanted from something,” which then expands into two sub definitions. In a technical sense, this definition means “taking a pure form of a substance out of another substance that contains it,” but in a religious sense it means “removing evil from one’s soul,” which suggests an ethical process behind removing substance from a whole. Integrity can thus be understood as the result of purification, which consequently entails a similar divide between physical and ethical properties. Still according to the Oxford dictionary, integrity is defined as “the state of being whole and not divided.” However, in its most common use, as noted by McFall (1987, 5), integrity is also defined as a “complex concept with alliances to conventional standards of morality – especially those of truth telling, honesty, and fairness – as well as to personal ideals that may conflict with such standards.” In the case of gold refining, integrity speaks to both sides of these definitions, that is as a physically undivided whole (99.99 % “fine” gold), and, more recently, as bearing qualities of honesty and fairness towards certain standards (“responsible” gold).

From an industry standpoint, what is at stake is that the technical purification towards obtaining fine gold inevitably goes hand in hand with erasing traces of its earlier states that would precisely give credence to claims of ethical integrity. The purification of bars and semi-finished products is thus not only a material operation, but also a social one, whereby the melting of gold from various sources, forms, and degrees of purity is turned into a new standardized item, cleansed from any trace of its previous social life. Such purification increasingly raises concerns surrounding what Les Field terms “uncontested assumptions” about the incommensurable exceptional nature and value of gold and its “alleged indestructibility and immortality” (2019, 176). As Field rightly notes, the assumed “indestructibility and [relative] immortality” of gold as a unique substance is a construct of western narratives, which have literally “liquidated” (2019, 166) other uses and conceptions of gold – a process which hints at the contentious ethical biography of gold. Take a ring, a bank ingot (“gold

⁵ While annual mined gold production was estimated to 3540 tonnes in 2019, LBMA listed companies only refined more than 5000 tonnes of gold, which stresses the large share of recycled gold. For a detailed mapping of the various actors and roles involved across the so-called global gold supply chain, see Verbrugge and Geenen (2020, Chap. 1).

bar") or a smartphone component; the gold in these items can just as well come from a large-scale gold mine in Canada, date back to the colonization of the Americas and the systematic theft of golden adornments, or originate from one of the many informal artisanal gold mines that have boomed in mineral-rich, but economically poor countries, after the 2008 financial crisis. What is more likely, is that the gold from these items came from a mix of these sources and was aggregated and disaggregated, smelted and recast, sold and resold, and moved across the boundaries of the licit and the illicit an uncountable number of times (e.g. Bolay 2021). It is the industry's construction of refined gold as both a circulating commodity and a financial asset – depending on its context of indexation in jewellery or finance – that continues to maintain the “public secret” (Taussig 1999) of gold's often-contentious origin. As could be put after Taussig, by restricting the understanding of gold's purification and integrity only to a material process, the refining industry has essentially demonstrated its ability to “know what not to know” (1999, 5–6), despite regular instances of the material resurfacing under the umbrella term of “dirty gold” (Bloomfield 2017; Pieth 2019). This emerging terminology echoes Mary Douglas' classic thesis on purity and danger (2002 [1966]), in which she argues that notions of dirtiness reflect material and embodied forms of social pollution that question societal classifications, orders, and values. In order to maintain the integrity of individuals, and by extension of the group they belong to, ambiguities and contradictions that could threaten an established societal order tend to be either separated and excluded, or ritually transformed into a socially acceptable form or product. In this view, the technical work of erasure done by refiners is part of such a ritual transformation.

It is also important to note that “purification” in the social sciences, especially in the field of the social studies of science, also carries a signification that precisely questions such dichotomies between the social and the material on which refiners' understanding of integrity is constructed. In *We have never been modern*, Latour (1991, 20–21) refers to purification as a process of continuously constituting separate social and material orders – those of humans and of non-humans – from hybrids of both. In this view, hybrids of nature and culture, like a gold bar, are purified from the networks of human and non-human agents that constitute them. Then, they are translated through works of mediation, for example in refineries, into interpretable objects. In Latour's words, such processes point to an important distinction regarding the role and capacities of agents: while so-called “intermediaries” transport meaning without transformation, “mediators” can produce new irreversibilities and potentially enable new uses (Latour 2006, 58). In the next section, I expand on how refineries' work of purification typically partakes in processes of mediation.

Gold refiners as mediating authorities

In most cases, the gold that enters a refinery for purification takes the form of *dorés*⁶, which designates non-standardized semi-purified bars chemically obtained out of the ore body at mine sites. However, the material to be refined can also include what the industry broadly

⁶ French term meaning “golden” used both in English and French for semi purified mined gold.

defines as “recycled gold,” which encompasses coins, already-refined bars, jewellery, and scraps obtained mainly from jewellery, dental, and electronic components. While metallurgy historians date the process and the fabrication of alloys malleable enough to be worked into jewellery and adornments in ancient Egypt back to 500 B.C., its current forms are closely tied to the emergence of national monetary systems, most of which used the gold standard, like in the UK where the value of the pound first started being fixed by statute to a weight and fineness of gold in 1717 (Schenk 2013, 19). With the emergence of the gold standard, the role of refineries shifted from merely providing an industrial smelting process to acting as guarantors of the gold’s value to national banks. This shift was substantiated by merging already-existing but separate processes and artisan works of smelting, assaying, and hallmarking into one single entity – the refinery – which then had to be accredited by the newly created Good Delivery List of the Bank of England in 1750 to enter the London Gold Market (Green and Murray 2011). Fire assaying consisted in testing the metal to define its degree of purity; refining consisted in enhancing this degree up to a certain standard; and hallmarking certified the product’s integrity regarding the standard. At the same time, issuance of paper money had to be backed in gold whose trade in London was not based on weight anymore, but on the face value of minted gold. This work of translating a naturally occurring substance with political considerations about the settling of central banks and later of finance banking, into a standardized financial artefact became the defining feature of gold refining.⁷

From this perspective, refineries proceed to a dual work of mediation and purification, following Latour’s terminology. On the one hand, refineries act as mediators in the production of hybrids (gold bars) to be traded within a qualified zone after having been assembled out of a network of physical substances, human labour, machinery and logistics, industry rules of compliance, international financial regulations, customs procedures, laboratory work, and other interconnected human and non-human agents and processes. On the other hand, refineries’ output is purified from all of these agents and their interconnections into a single, standardized, and commensurable product artificially made of purely “natural” gold. Hence, in demanding to transform the borders and entry criteria of the zone of the licit international gold trade in order to better account for the social and environmental conditions of gold production, voluntary regulations (such as the LBMA accreditation duplicated from the OECD guidelines) question the premises of this purification process. Through the idioms of transparency and responsibility, such initiatives pretend – although selectively – to render visible and legible the social life of gold and the networks that brought it into being prior to its legitimate and licit status as a commodity or financial asset.

Refiners thus inscribe the physical qualities of gold in a standardized cast or minted bar – broadcasting a serial number, a year of production, an assay, and the refinery’s hallmark against counterfeits, which in turn mediates the gold’s entry and future uses in the licit market. Yet, other authorities may also act as mediators to other zones of qualification earlier in the gold’s trail. For example, earth priests in Guinea perform sacrifices in which they inscribe gold’s qualities every time a new piece of land is about to be mined for gold (Bolay 2014). In

⁷ For instance, three of the current four major refineries in Switzerland were owned by the major Swiss banks (UBS, Crédit Suisse, SBS) (Lindt 2016).

doing so, they separate gold from their previous owners, *djins* who populate the underground and are said to be villagers' ancestors, so that the gold "stops moving" and, once it is stable, can be moved away from the realm of underground spirits in order to be handled as an object by the living. At a later stage, the central bank's officers in Conakry smelt the gold, assess its value, and inscribe its origin as "Guinea" into customs' export forms – even though it may have been smuggled from one of Guinea's neighbouring countries. In turn, the paper trail that these officers produce attributes qualities to the gold, both in terms of value and provenance, that enable its licit international shipment outside of the country. Refiners are thus one mediating authority amongst others, with the commonality that they conflate gold's material transformation – into raw ore, *dorés*, or minted ingots – with its rights to enter and be circulated within one zone of qualification in which successive irreversibilities are superposed but never contest their earlier versions.

Strikingly though, the material purification of gold itself may be almost anecdotal. If we consider that gold can be found in a purity of up to 23 carats, or 96 % purity, in certain regions of Guinea and Mali for instance, it means that there are very few impurities to remove until fine gold standards are achieved. This suggests that the value of gold is rather instilled through what Power (1999) calls "rituals of verification" rather than in the actual degree of physical integrity of the product, whose composition remains in fact hardly unchanged. Power's analysis of the audit society provides a fruitful entry point to understand refiners' role as mediating authorities. Indeed, it points to the dual characteristics of their verification practices, which always contain both "programmatic (normative) and technological (operational) elements" (1999, 6). As will be argued in the next section, these two components produce internal tensions surrounding the different normative definitions of gold's integrity as both physically true and ethically responsible, and antagonist operational processes of erasure and disclosure.

Reconciling physical and ethical integrity?

In another interview conducted in 2019, the head of a refinery explained the following:

You have to see the industry as a fortress. There are countless attempts to make fraudulent gold [including authentic gold with counterfeited hallmarks] enter the trade, and we have to protect it and constantly develop the technologies that allow us to do so. Otherwise, it's mainly compliance work and doing one's due diligence, and above all, it's about trust.

While the question was explicitly directed towards the operational elements of the authentication and refining process, the interlocutor implicitly assumed that the "programmatic" element of refineries was essentially to ensure the gold's physical integrity. The fact that refining did not only entail a material purification, but also a social one which erased all past traces of its production, was somehow dismissed as a technical, and inevitable, consequence of the industrial process of refining gold.

This emphasis on the operational, rather than on the normative, is especially salient in industry conferences, such as the LBMA biannual summit, where accredited refineries meet and share expertise. During one such event held in London in 2019, the largest and most attended session was devoted to “security and integrity.” Successive speakers described how their companies dealt with hallmarks’ counterfeits, identified scams, produced reference material to calibrate the purity analysis, developed sampling procedures of assaying, or secured transportation from the mines. Integrity, in this context, was essentially about ensuring that the batches of *dorés* or recycled bars entering the refinery were indeed composed of “real” physical gold to the same degree than what their suppliers claimed. This was indeed confirmed in a live poll, which showed that the first-ranking consideration of refiners in the audience was to identify counterfeits – for instance gold plated tungsten bars with a similar density to gold. Somehow, this shared concern appeared not to be so different to that of Antiquity’s roman craftsmen who worried about being cheated with substitutes and plated alloys (Oddy 1983, 52).

Strikingly, in spite of the emphasis placed on “responsible sourcing” and the importance of gold’s ethical integrity during the opening speech to the summit by LBMA executives, this second face of integrity seemed to be much less of a practical concern in the audience. While this might be interpreted as an illustration of the industry’s focus on the “theatricalisation of virtue” (Rajak 2011), rather than on enforcing normative changes in light of “responsible sourcing” initiatives, discussions with technicians, engineers and managers, who made up most of the audience, suggested instead an organizational “decoupling” (Power 1999, 95–97) of integrity’s two facets (physical and ethical) within companies. Ethical integrity was perceived as a legitimate concern, yet beyond the scope of their job.

The question of whether refineries ultimately also had to protect this ethical integrity however, was not totally eluded. Anxieties surrounding the origin of gold often gushed as a personal and moral concern, as explained by the head of one refinery’s laboratory:

All of a sudden, we are accused of supporting child labour and causing environmental harms. It’s not just about the company’s reputation. Personally, I don’t want to be associated with that in any way. But we are not miners, what can we do?

This interlocutor continued to explain how he had volunteered as part of one of his company’s corporate social responsibility (CSR) programs to provide technical training to aggregators’ partners in Peru, so that they would be better equipped to distinguish their sources and avoid taking and mixing gold from “dubious mines.” This engagement towards making gold more ethical was thus framed as a personal engagement, distinct from his actual job. Similarly, at one company which provides small Swiss jewellers with gold labelled as “fair trade,”⁸ the chief of operations explained that this new product had been integrated as an initiative of her own, as she felt that “[she] had to contribute in some way,” thereby separating her personal ethics from her company’s core business.

⁸ For a discussion of fair trade gold, see Oakley 2015.

Hence, small and medium companies see a transformation in their roles of guarantor, but they do not perceive themselves as being sufficiently equipped to protect “the market,” not only against counterfeits, but also against contentious origins and conditions of production. Large corporations, however, have for long integrated CSR and compliance officers within the dedicated branches of their organizations. At one such major refinery, this problem was unambiguously resolved by separating the production lines according to the declared provenance of gold, thereby enriching and diversifying the qualities attributed to refined gold:

We provide different goods. We can propose our clients three bars which have exactly the same characteristics. Physically, they are identical in all respects, be it their provenance. One bar originates from an industrial mine, another from recycled and the third is labelled fairmined. That's why [fairmined] is only part of our CSR. (...) As we can see so far, this production [of certified “fair” gold] is too small in volumes to be economically viable. It can find its way among certain jewellers, but otherwise it doesn't have much impact on the act of buying [in the investment or banking sector].

By inscribing provenance as a new quality, this refinery – like others financially and logically equipped to do so – would speak to what Oakley termed the various “facets of gold’s social identity” (2015, 158). In the western world, the most prominent facets are “elemental gold,” as a morally neutral element culturally determined by scientific definitions (2015, 159), and “economic gold” for its propensity to store, transport, and convert value (2015, 160), which in turn may convey moral consideration depending on its uses – for instance, in money laundering (Pieth 2019). Information on the provenance of gold thus adds a new facet to this analysis. As a response to growing campaigns against so-called “dirty gold,” some refiners, jewellers and luxury brands have started labelling some of their gold as “ethical” (Bloomfield 2017), allegedly to allow customers to make ethically-informed choices regarding its origin, despite the fact that it is the same elemental gold with the same economic value. Yet, the transmutations of “same gold” into different forms reverberates into legal classifications that tend to neutralize the ethical dimension of gold’s social identity.

Gold’s ambiguous materiality: commodity, jewellery, financial asset

The segmented logics presented above, between protecting gold’s physical integrity and taking into consideration ethical integrity as an additional concern, appear to work as a prolongation of the organizational decoupling between the maintenance of a status quo in core business on the one hand, and CSR investment on the other. One of the reasons to maintain this segmentation of integrity is that the “rituals of verification” (Power 1999) performed by refineries simply cannot accommodate contradictory normative purposes within the same operation. Indeed, the history of the gold industry clearly shows how the purification of the material contributed to the cleansing of its past lives to facilitate its entry in a zone of licit and legitimate trade. Swiss sociologist Jean Ziegler (1997) demonstrated, for instance, how the laundering by Swiss banks of gold held by Jews during World War II relied on coordi-

nated efforts to convert stolen assets into legitimate financial products for the Reich. Later, Sandra Bott, Sébastien Guex, and Bouda Etemad (2005) showed how an alliance of banks and refineries circumvented the embargo on South African gold production during the apartheid period in order to turn illegitimate South African gold into legitimate Swiss gold. More recently, a series of scandals revealed that several Swiss refineries participated in laundering gold used to finance conflicts (Pieth 2019). Hence, in all of these cases, it appears that the operational pursuit of gold's physical integrity goes hand in hand with the normative erasure of its contentious origins and past ownership.

This programmatic erasure in gold refining is neither just an activists' "fantasy," as was suggested in an interview by the CEO of one major company (Budry Carbó 2019), nor just a burden of the past. This double process of erasure and inscription conducted by refineries is enforced via legal classifications derived from the ambiguous materiality of gold inherited from the emergence of this industry as a subcomponent of banking. While gold is traded as a material commodity, it is legally treated as an abstract financial asset by the Swiss government since "the movement of precious metals is more closely related to payment transfers as a substitute for paper money than it is to the movement of commodities to be processed or used."⁹ Consequently, Swiss customs only have three classifications for gold: "unwrought," "monetary," or "jewellery" – while, for instance, cocoa imports are divided into no less than 45 categories based on quality. Only jewellery is subject to taxes, whereas monetary and unwrought gold are both treated as abstract financial assets, which means that the categories used to register gold are based on its material form rather than on its quality (in terms of purity) and value.

In addition, only the origin of mined gold is scrutinized through the LBMA Responsible Sourcing Program, while monetary gold and jewellery are considered "recycled," and thereby provenance-free. Playing on form has thus become a strategy of non GDL accredited refiners to access licit markets. For instance, newly-established companies in Bamako, Mali, seeking to seize the large artisanal production in the region, have acquired industrial technologies to pour mined gold directly into basic jewellery for export. A recent study also showed that gold from artisanal mines was massively imported by investors and refineries in Dubai, where it was then transmuted into jewellery, before being refined as "recycled" gold and transmuted again into licit gold bars (Ummel 2020).

Thus, the legal and institutional context meant to regulate the circulation of gold sustains its ambiguous and unique conception, whereby its legal qualities are not attributed according to its actual state and circulation as a material commodity. Instead, in alignment with outdated monetary concerns associated with the banking sector, gold is qualified according to its material form and thus becomes a "liquid" financial asset, like a currency, in LBMA chief executive's phrasing. Consequently, issues of provenance and product traceability have been largely circumvented, not only because of the technical limits of tracing a fungible, indestructible, and therefore continuously recycled substance, but also because of gold's ambiguous legal status, perpetually shifting along with its form.

⁹ https://www.swissinfo.ch/eng/business/international-trade_counting-gold-in-switzerland/41417986, accessed 2nd February 2021.

Whereas information on gold's provenance – albeit undisclosed – is overall perceived as relatively uncontentious for industrially mined gold, the story changes with gold coming from artisanal sources, whose social identity conveys stigmas of conflict and exploitation. With rising extraction costs and an increasing reliance on artisanal sources (Verbrugge and Geenen 2020), which represent close to 30 percent of global gold sources, the production of ethicality has become a prominent issue to allow artisanal gold to enter licit markets.

Artisanal gold, the ethical shifter

As for other highly valued mineral substances like diamond or gems (e.g. Calvão 2019; Cartier, Ali, and Krzemnicki 2018), the notion of transparency has been upheld as the means towards expanding gold's integrity to both its physical and ethical qualities. Transparency, broadly understood as the disclosure of information, is believed to “empower the weak [including small scale producers] and hold the more powerful [such as the refineries and their clients] accountable” (Mol 2015, 154). Following this logic, one way to provide more transparency lies in the traceability of gold, that is the ability to “track (from mine to market) and trace (from market to mine)” (Cartier, Ali, and Krzemnicki 2018, 212), upon which due diligence guidelines set against the LBMA Responsible Sourcing Program are expected to be conducted.

For the largest volumes of gold extracted industrially, traceability mainly translates into the systematic documentation (via paper trail for example) of *dorés* from the mines to the refineries, with whom they usually have exclusivity contracts. Refiners agree that, although it requires high “compliance costs,” tracking gold does not pose too many logistical issues. Indeed, the enclave model of industrial extraction implies shipping gold without any go-betweens other than air fret and security transport firms, which makes traceability easy to achieve. Yet, as explained by several refiners, most anxieties conflate around the possible “contamination of flows” by artisanally mined gold, which, because of its widespread association with crude forms of exploitation, is classified as “major risk” in the OECD guidance and its LBMA replica.

Nonetheless, a new trend towards more direct sourcing was elicited in the closing remarks of the 2019 OECD Forum on Responsible Mineral Supply Chains, during which refineries were urged to source from the artisanal sector and encouraged to see artisanal mines as an opportunity rather than a risk. The rationale underpinning this new position entails two dimensions. First, that refineries should enable licit routes, assume the high compliance costs associated with them, and thereby “contribute to development” in the Global South. Second, that with decreasing deposits and rising extraction costs, artisanally mined gold is essentially a cheaper supply source, as noted by the director of Metal Focus at the LBMA 2019 responsible sourcing workshop.

As you know, the cost of compliance [for artisanally mined gold] is exceptionally high, and it's rising. Yet, if you speak with many refineries, many of them will tell you that the value added to the product is rising so much, or certainly not keeping pace with the increase in compliance

costs. (...) Even with the risks, the fact that the artisanal sector is such a large area and that we see global growth in mine production slowing combined with a continuous drop in recycling, makes it a tremendous opportunity for the industry.

In other words, artisanally mined gold is always profitable. The issue is that the social identity of artisanal gold can never be neutral. The same gold can either be charged positively as a manifestation of corporate benevolence in supporting the livelihoods of mining communities and fostering local development (e.g. Childs 2014), or, conversely, be charged negatively as a way for corporations to profit from crude forms of exploitation (e.g. Bloomfield 2017). Hence, whether gold can be considered legitimate (or not) to enter the zone of licit trade under the LBMA banner, depends above all on the compliance infrastructure put in place by refiners and other actors along the supply chain, or what these actors refer to as “the burden of audit.” Put differently, anxieties of “contamination” reflect what can be coined as “dangers of social pollution,” which audits are meant to prevent by normalizing possible ambiguities to reach unequivocal interpretations (Douglas 2002 [1966], 58–59).

Yet, given the high costs and increasing distrust of audit firms cumulating roles of clients and guarantors, and acting as consultants rather than accountants (Shore and Wright 2018), a new trend towards delegating traceability and trust to decentralized digital ledgers, also called blockchains, has attracted considerable attention in the space of gold refining, notably for making artisanal gold licit. The second half of this article will thus interrogate how this technology is used by analyzing the industry’s attempts to accommodate gold’s ethical and physical qualities within one expanded notion of integrity. I suggest that, in view of its initial purpose, blockchain works as an intermediary, in Latour’s words. Indeed, this technology is able to displace fetishism onto the digital without transforming the interpretation of the object it carries. But once in operation, the technology also becomes a mediator and enables new uses of gold.

Digital fetishism and divisible integrity

As outlined in the previous sections, refiners face conflicting issues in fabricating gold’s integrity, as the process needs to accommodate physical purification (erasure) while ensuring its traceability and ethicality (disclosure). These conflicting issues lead the industry to envision differential integrities: that is ethically different, yet physically identical gold items. Compliance to certifications – or their absence – inscribe gold on an ethical continuum based on its degree of traceability, ranging from gold noncertified by Good Delivery listed refiners, GDL listed refiners, single mine origin (SMO) gold, to fair trade gold. These qualities are substantiated in separate supply chains and production lines whose segregation manifests the difficulty of refineries to accommodate two conceptions of integrity that are in fact drastically opposed. Here, I discuss the perceived potentialities that a new digital technology – blockchain – has crystallized in the industry of gold refining to accommodate the conflicting physical and ethical integrities of gold.

Gold on blockchain: from intermediary to mediator

Blockchains are public or private distributed digital ledgers that are said to be able to “support chain of custody through a system that makes documentation tamper-proof and, potentially, provides new opportunities for traceability” (Cartier, Ali, and Krzemnicki 2018, 221). The main appeal of blockchain in the refining industry is that its decentralized architecture, like cryptocurrencies for which the system was initially developed, allows to digitally record and verify every transaction in an encrypted “block” so that it can be stored in an immutable ledger (Calvão 2019). At first sight, blockchain can thus be considered as an “intermediary” for acting merely as a repository – an immutable ledger – able to “transport meaning without transformation” (Latour 2006, 58). Refineries, in turn, maintain their role as mediators by attributing unequivocal interpretations to gold. Yet, a closer look at the uses of the technology suggests that blockchain may also become a “mediator.” Indeed, by transmuting physical gold into the digital, the technology can also produce new irreversibilities and enable new uses.

Blockchain-based traceability systems are appealing because they might make centralized and costly third-party auditing redundant, by creating immutable digital traces of the gold’s journey without compromising the privacy of ownership along its trail. As put by one refiner, “the good thing is that we can store verified information, and above all control with whom it is shared.” The second appeal is cost, as presented by an IT engineer at a training workshop for smelters and refiners:

Blockchain does not rely on WET code [Write Everything Twice, or humanly repeated coding prone to errors]. It operates without the need for inputs from people. Once you have invested in the infrastructure, what is great with blockchain is that everything is DRY code [Don’t Repeat Yourself, or automated coding] and it functions autonomously.

As a result, besides privacy, the main advantages identified by the proponents of this technology were that human errors could be eradicated and costs could be minimized, because as noted by the IT instructor “once implemented you just have to maintain one copy of that blockchain which is propagated to the other nodes.”

As defined by the instructor quoted above, blockchain works as an “intermediary” for it defines the relationship between actors such as refiners, suppliers/clients, or producers. Blockchain “describes their networks,” (Callon 1991, 139) which include the human and non-human actors at stake in the transaction, such as gold and its recorded qualities, the price, the traders, producers and the refineries involved; and once inscribed onto the ledger, this description is irreversible. From this perspective, the technology raises paradoxical expectations. As an intermediary, blockchain has the purpose of dis-intermediating relations, such as auditors’ brokerage, since it can circulate on its own through automated and autonomous coding. At the same time, the irreversibilities blockchain circulates on ledgers are inevitably based on human appreciations at the entry point, or what industry actors refer to as the problem of “garbage in, garbage out.” What is left is thus an immutable description of the network at successive stages of the supply chain, whose transparency of operation is

the product of an “institutionalised second-order description” (Strathern 2000, 313), for example reports written by a compliance officer or an NGO delegated for this purpose. Against utopian visions of an automated post due diligence future, no longer based on “reasonability, judgment and ethical self-fashioning” (Maurer 2005, 476), but on *DRY code*, most of the interlocutors agreed that transparency would still require “boots on the ground,” as one LBMA executive put during an industry talk.

So, if blockchain technology cannot replace a “qualitative mode [of due diligence, which is] the production of narratives that make visible certain actors, relationships and processes in the past” (Hansen and Flyverbom 2015, 878), it nevertheless can store and circulate records of both the physical and ethical qualities of gold into an “algorithmic mode of due diligence,” thus producing truths where numbers are believed “to speak for themselves” (2015, 883). Most importantly for refiners, the blockchain system allows to keep the content of each encrypted block secret, as they gain their authentication strength only in relation to other blocks. Thus, as an intermediary, blockchain does not change the normative aims of rituals of gold verification. Rather than attempting to “counter the pervasiveness of commodity fetishism [by making] visible and relevant the social relations that underlie production and exchange” (Hudson and Hudson 2003, 413), including those of small-scale miners within the gold supply chain, blockchain as an immutable ledger, may reinforce fetishism by becoming a fetish in itself, like labels, certifications, and audit reports.

However, the operational side of the blockchain system also deserves attention, for, like any technology, it generates “novel and previously unthinkable” options (Callon 1991, 132). In particular, the digital tokenization of gold points to its role of mediator whereby bars’ physical and ethical integrity becomes divisible. To allow a systematic record of transactions – or networks descriptions in Callon’s words – one of the premises of the technology is that gold and its various qualities get to be digitally encoded at different stages. While this was often presented as a technical detail within a larger infrastructure of traceability, once digitized, gold becomes not only traceable, but also divisible and tradable at any scale without necessarily relying on intermediaries such as banks, refineries, or exchange traded funds (ETFs). This means that any portion of gold physically stored in a vault and digitally inscribed in a block, be it the 0.01-gram portion of an allocated bar, or a redeemable large bar of 12.4 kg, can be acquired or sold instantaneously. Similarly, the gold’s ethical integrity could be divided through so-called mass balance, whose principle allows to mix certified and non-certified materials if the exact volumes entering the supply chain are controlled with equivalent volumes at the exit point. One single bar could thus be encrypted with various ethical inscriptions, such as a certain percentage smelted out of standard GDL compliance gold and another out of a fair-trade certification scheme.

The paradox of de-materialising gold to make it more liquid in trade, while resorting to its materiality for valuation purposes is not new. For instance, Elizabeth Ferry (2020) interrogates the role of gold’s materiality as a source of value in finance, in particular in the case of so-called “paper gold” to designate gold in Exchange Traded Funds (ETFs), which are investment devices that allow the buying of shares in a basket of gold indexed to the price of the commodity in order to trade them without having to physically possess the material (Ferry 2020, 106–107). With ETFs, Ferry shows how gold plays contradictory roles “acting

both as a sign of speculative practice and marker of probity and ‘real value’” (2020, 93) and thus “straddles the seemingly opposing poles of solidity and speculation” (2020, 97). By looking at digitized gold on blockchain technology, I bring in other forms of gold in between these two poles, which I illustrate through the cases of gold-backed cryptocurrencies and the tokenization of gold traces in digital coin offerings (ICOs). Indeed, such digitized forms also convey contradictory representations of gold as a physical store of value and as a source of speculation. However, they do so in ways that seek to conciliate both through transparency devices that make certain qualities of gold’s integrity visible, and thereby its digital form tangible.

Digitized gold in gold-backed cryptocurrencies

In the space of cryptocurrencies, blockchain technologies are increasingly mobilized both to establish a link to gold deemed more direct than through ETFs, and to circumvent the regulations applied to these financial instruments. Various cryptocurrencies backed with digitized gold have recently been developed either by refineries, or with the support of refineries and vaults. These are meant to open a new space for investment in between “paper gold” and “physical gold” with the aim of appeasing what Ferry coined as “anxieties [conveyed by ETFs development] concerning the continuing creation of financial vehicles and instruments and their relationship to so-called ‘real value’ as embodied in tangible objects” (2020, 107).

Gold-backed cryptocurrencies usually follow the same logic. LBMA certified gold bars are encoded in a blockchain with a fixed corresponding number of digital tokens. In contrast to highly volatile cryptocurrencies whose market value is assumed to rely on unregulated offer and demand only, digitized gold tokens promise not to be worth less than the spot price of the physical gold of which they are meant to act as a more “liquid” digital double. One token is usually equated with common metrological standards of one gram or one tenth of a fine troy ounce. Tokens are thus issued as a digital proof of ownership of allocated gold in a vault, tradable anytime without an intermediary (other than the blockchain which supports it), and redeemable into physical gold. Many efforts, which largely resort to visualization techniques and a segmented access to the insurance data of gold’s integrity provided by refineries, are consequently deployed to render these digital assets tangible. By way of example, after purchasing Ethereum – a popular cryptocurrency – from a crypto trading platform, I could use them to buy digitized gold tokens on several other online platforms. Much of these providers’ rhetoric revolved around direct ownership and transparency, which epitomizes ideals of dis-intermediation common to blockchain proponents.

Direct ownership is substantiated in the access to pictures of the physical gold bars, audit data, purchase receipts, assay certificates, responsible certifications, and asset identification on the dedicated blockchain, which speak to the ethical and physical integrity of the product. In providing this data, blockchain works as an intermediary repository, which does not actually provide additional information – or more transparency – on gold, but rather enables the storage of previous inscriptions within one block. As a result, digital traces that have been

produced to credit claims either of ethical (responsible certifications) or of physical (refiners and assayers' certificates) integrity cohabit and are attached to one single item. In Birchall's words (2016, 157), in this case the blockchain serves a "management of visibility" rather than of "visuality" that would inform on the conditions determining the scope of looking. Although such systems display qualitative and quantitative transparency features, they remain tied to the refinery as the sole mediator and guarantor of gold's integrity and, thus, exclude earlier segments of the gold's social life – an information which is of little concern in the field of investment, for which digitized gold is designed.

It is precisely in the field of investment that blockchain ceases to be just an intermediary and becomes a mediator in Latour's sense (2006, 58). Once encoded and transmuted into digital tokens, physical gold bars are divisible and instantaneously tradable, which enables fast trading on small price variations – as is commonplace with cryptocurrencies. This is a stark contrast to dominant conceptions of gold as a safe haven asset suited for long term investments. Through such uses, transparency is further performed by the possibility to track the blocks and attached transactions. Such visualizations of transparency, by making lists of encrypted hashes visible, yet incomprehensible, partake in a paradox pointed by Birchall (2011, 14), in which while technologies of "transparency attempt to promote trust, we still have to trust in [their] procedures and promise." From this perspective, blockchain, as an intermediary, accommodates various traces of integrity, including ethical certifications. However, as a mediator, blockchain does not translate gold towards a consubstantial physical and ethical integrity, as its proponents' claims to a superior form of transparency would suggest, rather the technology produces a new fetish – more liquid and easily tradable.

Digitized gold traces in ICOs

If digitized gold maintains ethical and physical integrity segmented, what does the technology do when it is precisely mobilized to counter the tendency of commodity fetishism? Among the various technology providers interviewed who were involved in pilot projects for tracking and tracing artisanal "ethically" produced gold using blockchain or compatible infrastructures, several mentioned that, in the absence of substantive financial support from the outset, the technology was very hard to implement. Besides the expensive digital infrastructure itself, traceability of small quantities originating from various artisanal mines requires considerable additional labour. For instance, in a pilot project in the Democratic Republic of Congo (DRC), artisanal miners, grouped in cooperatives supervised by a Canadian NGO that implements the due diligence, can sell their production to a registered buyer who collects and registers all purchases on paper before bringing them to a dedicated buying house. There, all purchases are segregated from those of other mines. Then, they are logged onto a digital traceability platform together with copies of the paper trail for export, thereby allowing full chain of custody for the importer. As was explained by one manager of the project, this process of traceability requires continuous additional monitoring work by technicians, registered traders, NGO and cooperative members, which is not compensated at the buying price, and ultimately represents under ten kilograms of gold per year. Allegedly

working on small margins, refiners, who are the only gateway to the licit market, consider such a quantity of gold not profitable enough.

One way to circumvent this “loop,” according to another traceability and blockchain protocol provider, would be to “tokenize” the gold in order to attract funding by settling an Initial Coin Offering (ICO). ICOs are an emerging funding mechanism, especially popular in the economic space of start-ups, which consists in issuing “tokens” on the model of cryptocurrencies that can be purchased from a limited stock at a defined time before the launch of the project. Unlike shares in the stock market, the acquisition of ICO tokens does not credit ownership on parts of the issuing company, but it does give a right to access the products or services provided by the company.

For instance, one blockchain provider, involved in a pilot project of traceability for artisanal gold, explained how his company was in the process of tokenizing not the gold, but “smart contracts” to trace the gold, to enable the decentralized traceability network to work. Every transaction, transmutation of gold, and due diligence data would be encrypted in a block, just as in the previous example, but in two separate hashes. Subsequent owners or companies, later in the chain, would then have to use the issued tokens to decrypt the data assembled from different blocks, store them and re-encrypt them, adding their own compliance data, into two separate hashes and data packages, and so on. Through this process, the system promises to maintain privacy while enabling decentralized verification,¹⁰ but at fluctuating costs depending on the token’s value. As this interlocutor put it, “the ICO allows us to raise funds and finance the system, but if our tokens become too expensive it can also be an impediment for the network to grow.”

In contrast to ETF “paper” gold documented by Ferry (2020), or to refined gold-backed cryptocurrencies presented above, tokenization processes delineated here do not bank on the financial value of physical gold, but on the production and access to traces of its physical and ethical integrity. From this perspective, the assumed intrinsic value of physical gold purified to a degree approaching the chemical “purity” of the element Au, as often argued by industry actors, or its alleged natural scarcity, as traditionally argued by economists starting with Marx (Schoenberger 2010, 3), should be nuanced in favour of its successive inscriptions into qualified zones of valuation. Rather than the material itself, the illustrations above suggest that gold gets much of its value through irreversible translations and transmutations at the intersection of natural, social, and digital orders, yet without necessarily redistributing this value down to the miners.

Conclusion

By tracking how gold’s dual dimensions of integrity, physical and ethical, are fabricated in the purification process of refining, this article has depicted the socio-material techniques deployed by the gold industry to accommodate seemingly irreconcilable processes of erasure

¹⁰ Privacy is ensured through the principle of self-sovereign data, meaning supply chain, certification, and supporting data are visible only to the owners of the data, and not to third parties or other users of the system.

and disclosure. In doing so, it followed how gold's qualities were inscribed through mediations and transmutations into different material (jewellery, dorés, gold bars) and non-material forms (financial assets, digital tokens), hence enabling it to cross the boundaries of the licit and the illicit, the legitimate and non-legitimate, and to neutralize or activate markers of (un) ethicality.

Though most of the responsibility apparatus of refining companies maintains a segmented understanding of gold's integrity, along with well-established corporate strategies of decoupling business and CSR, the irruption of a new digital technology, blockchain, meant to decentralize verification processes, brings promises to accommodate gold's physical and ethical qualities within one expanded notion of integrity through new performances of transparency. In addition, blockchain appears to fulfil more than just one function. As an intermediary, it prolongs fetishism, and reinforces the segmentation of integrity in a digital and immutable order, which maintains the industry's logics of decoupling rather than enforces more accountability towards the producers. However, once in use, blockchain appears to act beyond its role as a transparency device. By inscribing physical gold into an encrypted digital ledger, the technology works as a mediator and translates gold into a digitized form that enables it to be both integral and divisible. Digitization thus fosters new uses of gold, making it more liquid, more rapidly tradable, and potentially more speculative. In so doing, this digital fetish opens new fields of value, not out of the gold itself but out of its traces, from which, paradoxically, ground producers selling physical gold remain excluded so far.

References

Appadurai, Arjun. 1988. "Introduction: Commodities and the Politics of Value." In *The Social Life of Things: Commodities in Cultural Perspective*, edited by Arjun Appadurai, 3–63. Cambridge: Cambridge University Press.

Barry, Andrew. 2006. "Technological Zones." *European Journal of Social Theory* 9, no. 2: 239–253.

Birchall, Clare. 2016. "Managing Secrecy." *International Journal of Communication* 10: 152–163.

Birchall, Clare. 2011. "Introduction to 'Secrecy and Transparency' The Politics of Opacity and Openness." *Theory, Culture & Society* 28, no. 7–8: 7–25.

Bloomfield, Michael J. 2017. *Dirty Gold: How Activism Transformed the Jewellery Industry*. Cambridge: MIT Press.

Bolay, Matthieu. 2021 (à paraître). "Des réseaux aux chaînes d'approvisionnement. Économies morales et performances de moralisation dans le commerce de l'or au Mali post 2012." *Politique Africaine* 164.

Bolay, Matthieu. 2014. "When Miners Become 'Foreigners': Competing Categorizations within Gold Mining Spaces in Guinea." *Resources Policy* 40: 117–127.

Bott, Sandra, Sébastien Guex, and Bouda Etemad. 2005. *Les relations économiques entre la Suisse et l'Afrique du Sud durant l'apartheid (1945–1990)*. Lausanne: Antipodes.

Budry Carbó, Adrià. 2019. "Metalor, entre les orpailleurs et les 'fantasmes'", *Le Temps*, July 11. Accessed April 28, 2021. <https://www.letemps.ch/economie/metalor-entre-orpailleurs-fantasmes>.

Callon, Michel. 1991. "Techno-economic networks and irreversibility." In *A Sociology of Monsters*, edited by John Law, 132–161. London: Routledge.

Calvão, Filipe. 2019. "Transparent Minerals and Opaque Diamond Origins." In *The Anthropology of Precious Minerals*, edited by Elizabeth Ferry,

Annabel Vallard, and Andrew Walsh, 147–163. Toronto: University of Toronto Press.

Calvão, Filipe. 2019. “Crypto-miners: Digital Labor and the Power of Blockchain Technology.” *Economic Anthropology* 6, no. 1: 123–134.

Cartier, Laurent E., Saleem H. Ali, and Michael S. Krzemnicki. 2018. “Blockchain, Chain of Custody and Trace Elements: An Overview of Tracking and Traceability Opportunities in the Gem Industry.” *Journal of Gemmology* 36, no. 3: 212–227.

Crowell, Ruth. 2016. “The LBMA – Providing a Chain of Integrity in the International Gold Market.” *Alchemist* 83: 6–7.

Childs, John. 2014. “From ‘Criminals of the Earth’ to ‘Stewards of the Environment’: The Social and Environmental Justice of Fair Trade Gold.” *Geoforum* 57: 129–137.

Douglas, Mary. 2002 (1996). *De la souillure. Essai sur les notions de pollution et de tabou.* Paris: La Découverte.

Ferry, Elizabeth. 2020. “Speculative Substance: ‘Physical Gold’ in Finance.” *Economy and Society* 49, no. 1: 92–115.

Field, Les W. 2019. “Gold, Ontological Difference, and Object Agency.” In *The Anthropology of Precious Minerals*, edited by Elizabeth Ferry, Annabel Vallard and Andrew Walsh, 164–186. Toronto: University of Toronto Press.

Green, Timothy, and Stewart Murray. 2011. *History of the London Good Delivery List 1750–2010.* London: LBMA.

Hansen, Hans K., and Mikkel Flyverbom. 2015. “The Politics of Transparency and the Calibration of Knowledge in the Digital Age.” *Organization* 22, no. 6: 872–889.

Hudson, Ian, and Mark Hudson. 2003. “Removing the Veil? Commodity Fetishism, Fair Trade, and the Environment.” *Organization & Environment* 16, no. 4: 413–430.

Jacka, Jerry K. 2018. “The Anthropology of Mining: The Social and Environmental Impacts of Resource Extraction in the Mineral Age.” *Annual Review of Anthropology* 47: 61–77.

Latour, Bruno. 2006. *Changer de société, refaire de la sociologie.* Paris: La Découverte.

Latour, Bruno. 1991. *Nous n'avons jamais été modernes, Essai d'anthropologie symétrique.* Paris: La Découverte.

Law, John, and Annemarie Mol. 1995. “Notes on Materiality and Sociality.” *The Sociological Review* 43, no. 2: 274–294.

Lindt, Angela. 2016. “Speech is Silver, Silence is Golden: Gold Refining in Switzerland.” In *The Open Cut: Mining, Transnational Corporations and Local Populations*, edited by Thomas Niederberger, Tobias Haller, Helen Gampon, Madlen Kobi, Irina Wenk, 103–116, Zürich/Berlin: LIT Verlag.

McFall, Lynne. 1987. “Integrity.” *Ethics* 98, no. 1: 5–20.

Marx, Karl. 1976 [1867]. *Capital: A Critique of Political Economy, Volume 1.* London: Penguin Books.

Maurer, Bill. 2005. “Due Diligence and Reasonable Man, Offshore.” *Cultural Anthropology* 20, no. 4: 474–505.

Mol, Arthur P. J. 2015. “Transparency and Value Chain Sustainability.” *Journal of Cleaner Production*, 107: 154–161.

Oakley, Peter. 2015. “Introducing Fairtrade and Fairmined Gold: An Attempt to Reconfigure the Social Identity of a Substance.” In *The Social Life of Materials: Studies in Materials and Society*, edited by Adam Drazin and Susanne Küchler, 155–74. Bloomsbury.

Oddy, Andrew. 1983. “Assaying in Antiquity.” *Gold Bulletin* 16, no. 2: 52–59.

OECD. 2016. *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas.* Paris: OECD Publishing.

Pieth, Mark. 2019. *Gold Laundering: The Dirty Secrets of the Gold Trade.* Zürich: Salis.

Power, Michael. 1999. *The Audit Society: Rituals of Verification.* Oxford: Oxford University Press.

Rajak, Dinah. 2011. “Theatres of Virtue: Collaboration, Consensus, and the Social Life of Corporate Social Responsibility.” *Focaal* 60: 9–20.

Richardson, Tanya, and Gisa Weszkalnys. 2014. "Introduction: Resource Materialities." *Anthropological Quarterly* 87, no. 1: 5–30.

Schenk, Catherine R. 2013. "The Global Gold Market and the International Monetary System." In *The Global Gold Market and the International Monetary System from the Late 19th Century to the Present*, edited by Sandra Bott, 17–38. London: Palgrave Macmillan.

Schoenberger, Erica. 2010. "Why is Gold Valuable? Nature, Social Power and the Value of Things." *Cultural Geographies* 18, no. 1: 3–24.

Shore, Chris, and Susanne Wright. 2018. "How the Big 4 Got Big: Audit Culture and the Metamorphosis of International Accountancy Firms." *Critique of Anthropology* 38, no. 3: 303–324.

Strathern, Marilyn. 2000. "The Tyranny of Transparency." *British Educational Research Journal* 26, no. 3: 309–321.

Taussig, Michael T. 1999. *Defacement: Public Secrecy and the Labor of the Negative*. Stanford: Stanford University Press.

Ummel, Marc. 2020. *Détour doré. La face cachée du commerce de l'or entre les Émirats arabes unis et la Suisse*. Bern: Swissaid.

Verbrugge, Boris, and Sara Geenen. 2020. *Gold Production Touching Ground*. Cham: Palgrave Macmillan.

Vilar, Pierre. 1974. *Or et monnaie dans l'histoire: 1450–1920*. Paris: Flammarion.

Ziegler, Jean. 1997. *La Suisse, l'or et les morts*. Paris: Le Seuil.

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