The Missing Ethics of Mining

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In the middle of the 1980s the pastoralists of Essakane, Burkina Faso, were dying. Drought gripped the drylands of West Africa, crippling peoples' semi-nomadic livelihoods of millet farming and goat herding. When rain finally returned after three years, the earth had hardened like concrete and water skimmed across the floodplain, barely penetrating the surface. Without arable land the people faced famine—until they discovered gold. Instead of a disaster area, Essakane transformed into a commercial oasis: a mining town of 10,000 miners and traders where gold is processed and exchanged for food, cloth, spices, and animals.

The market becomes frantic before festivals as everyone from fifty square miles converges to tailor new clothes and butcher meat. The town has dirt roads and mud homes, yet despite this lack of infrastructure many elements of modern urbanism are present, including gas stations, auto mechanics, chemicals suppliers, pharmacies, and water distributors. Essakane is the wholesale center for the region, and without its economic influence the area risks reverting to a state of famine.

Not long after becoming a mining town, Essakane became a target for international investors. This dynamic is common. With some exceptions, metals today come from areas that were first discovered and exploited many years ago. The minerals that are easiest to extract have already been exhausted, but mineral production in these areas has been extended through advances in geological and engineering sciences that enable extraction of low-grade ores. And yet, as much as modern mining depends on precise technical expertise, exploration geologists still spend much time trekking in remote areas, learning about the geological formations from local residents, especially miners.

A few miles outside the town there is a mine so expansive and deep it seems that only machines could have made it. Not so. The crater was dug from lateritic rock entirely by hand. I visited the mine the afternoon before a feast, and it was

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quiet except for a man in a four-cornered turquoise tunic who was repeatedly pouring the contents of one bucket into another. He was wind-mining. When miners have neither equipment nor chemicals, and do not even have water, they can let the wind work as a separator. Back and forth they pour, again and again, from one bucket to the other, until, if they are lucky, a particle of gold is revealed. Wind-mining is the absolute economic bottom. "My crop failed," the man said grimly, explaining that he had come from far away. "I'm here because I have nothing to feed my family."

Essakane is in northeastern Burkina Faso, which is north of Ghana, east of Mali, and west of Niger. To get there I flew from sleety Paris over the Sahara to the Sahel. For a time there is only an endless horizon of terracotta sand, but as the aircraft descends villages appear—squat huts clustered in circles along dry riverbeds, goats grazing in the dying light. Not two minutes later there are factories, roads, automobiles, and city lights. This is the capital, Ouagadougou. It used to be a joke among American diplomats to say to a fellow Foreign Service Officer who was at risk of being punished for some bureaucratic offense, "Be careful or the undersecretary will send you to Ouagadougou."

People often presume that the lonely prospector with hammer or pan—engaging in what used to be called "practical" and is now called "artisanal" mining—no longer exists. In fact, there has never been a time when more people depended on artisanal mining. We do not know exactly how many of these miners there are: the numbers are always shifting with the seasons and fluctuations in commodities prices, as well as economic failures, wars, and the effects of climate change. Tens of millions is what we suspect, and the number is growing all the time.

The effort to transform Essakane from a town dominated by artisanal mining to one focused on industrial mining failed several times. In 2000 the International Monetary Fund told the Burkinese government it needed to sell off its stake in the mine, undo its monopoly on the gold trade, and open the resources to foreign investment. Soon thereafter, a British company purchased the property. It sold the mine to a Canadian company. The Canadians sold it to South Africans. The South Africans sold it back to the Canadians. These Canadians sold it, again, to other Canadians.

In 2008, I visited this area as a contractor for an agency of the World Bank. I had recently written a doctoral dissertation about artisanal mining, while working as part of a United Nations environmental research and technical assistance group

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whose aim was to address mercury pollution. Artisanal miners are the world's largest remaining users of elemental mercury, a potent neurotoxin whose industrial use is declining in every other sector. In the course of our project, however, we also observed two new disturbing trends in mining. First, the number of artisanal miners was spiraling uncontrollably, tripling and quadrupling in lockstep with the steep rise in the price of gold after September 11, 2001. Second, many of the places we were studying were subject to increasingly tense—and frequently violent—land-use conflicts between local artisanal miners and foreign industrial mining companies. Because our remit (and funding) was limited to studying the environmental effects of mercury from artisanal mining, we had no mandate to examine these conflicts. While I had read about coexistence interventions being applied by the World Bank and other international development agencies to these conflict areas, this was my first occasion to experience them directly.

By the time I arrived in Essakane, the Canadian company that owned the mining rights was completing a complicated negotiation with local miners to move the town. When a mining company builds a mine, it puts its camp away from the pit and processing plant. But artisanal miners build directly on top of where they mine. The whole town is permeated by the industry. Residences are next to the operations. Miners bring their bags of ore home with them, crush the rocks by hand (or by machine, if they can afford it), then wash, pan, and amalgamate (with mercury) the crushed ore in a water pit. More often than not, this means they live on top of the gold deposit. Therefore, if you want to build a big industrial mine, the village or town has to be removed.

An industrial mine requires many things to make the business work. It needs top geologists, geochemists, mining engineers, trained labor, expensive machinery, roads, security, and complex chemicals; since most mines are off the grid, it needs a power plant; and above all, it needs enormous volumes of water. The only significant source of water in Essakane is a river that runs for two to three months per year during the rainy season, so the mining company's plan was to dam and divert the river to feed the mine. "What about the people who rely on the river downstream?" I asked the company's in-house sociologist. "That is a question we do not discuss out loud," he answered, chillingly.

I could see that the sociologist was concerned. Access to water is the region's critical issue: there is less than one well for every 500 people. But this was a decision taken above his pay grade. To ask about the mine's water usage was to pose a paradigmatic question, so obvious yet so subversive that if you wished to

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keep your job you would bite your tongue. I faced the same predicament. Calling into question the fundamental viability of the mine, its sustainability, was not possible for either of us.

There is no international law governing mining projects. Instead, there are more than a dozen codes, covenants, and standards, all voluntary and self-enforced. These include the International Cyanide Management Code, the Equator Principles, the International Finance Corporation's Performance Standards, the Global Reporting Initiative, the Extractive Industries Transparency Initiative, the Natural Resource Charter, and the United Nations' "Ruggie Principles," to name just a few. Every new framework attempts to trump the preceding ones by defining *the* essential principles of corporate engagement in mining projects. But these different frameworks also reflect an underlying competition among development agencies, scholars, and practitioners. Many of these organizations and individuals are competing for funding from the same small group of donors, and often aim to fund their specific initiatives through membership fees from the companies they are attempting to influence. Across these initiatives, the guiding principle is to promote economic development that benefits everyone involved —foreign companies, host governments, as well as local communities—not to question the underlying economic and ecological value of specific mines. The expansion of mining is accepted as inevitable.

In my case, the assessment I was supposed to write permitted me to comment only on the adequacy of the process for moving the town—"resettlement" as international functionaries call it. As I understood it (I was not an expert in this area), my task was to assess whether the Canadian mining company in Essakane had properly implemented the part of the International Finance Corporation's standards that dealt with resettlement. These standards are heavy with terms like "minimize," "mitigate," and "adequate," as in "minimize involuntary resettlement" or "mitigate adverse impacts." It is a rhetoric of imprecision. There were two other consultants working for a different consulting firm whose job was to move the villagers; they were drowning in paperwork documenting the fairness of the compensation to the residents of Essakane, which nevertheless overlooked a fundamental problem with the development plan. The government owns the subsurface mineral rights, so the miners of Essakane had no formal title. The mineral rights were negotiated directly between the government and the company, and the company was only required to compensate people for what belonged to them above the surface. As a result, the miners would gain new homes, but lose their

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jobs. "What will they do without the gold?" I asked the resettlement planners. I was told they would farm instead.

I went to the villagers to ask them how they would feel about farming. "If we cannot mine, we cannot live," one man said without hesitation. "If there were no more mining, it would be the end of the world." Area residents had been mining for more than twenty years: none of them knew how to farm. Their children were also raised as miners, sleeping as infants strapped to their mothers' backs while the women washed gold. By age eight they were crushing stones with metal pestles, and when their bodies matured they worked as diggers, following gold veins down thirty meter shafts.

We sat in a circle in an open-air meeting hall—surrounded by walls but with no roof—a quorum of ten miners and me. Luckily it was the beginning of harmattan, a cooling wind blowing from the desert that lasts for three months and makes nights brisk. A few of the men wore winter coats. It was 30 degrees Celsius, mild compared to after the harmattan, when temperatures soar over 50 degrees and every shadow becomes a precious refuge. Essakane is still in the Sahel, but the Sahara is only twenty kilometers east. At night when the wind blows, you can smell the desert.

After an hour of discussing the company's plan to relocate the town outside the mining concession and transform the miners into farmers, the men became impatient, fidgeting and peering toward the door. It is no problem for a bureaucrat or consultant to linger in deliberation, but for a miner these missed working hours are pure loss: they are the difference between being able to buy food and going hungry. The miners needed to get back to work. Before leaving, however, a greybeard in the group wanted me to understand something.

"Every day of my life is a war," he said. "If one day I am mining and I find gold, it's okay. If I die, or if my child dies, this is also okay." Then, looking directly at me and extending a pointed finger, he asked: "Can you set me free?" I thought about my visit to the mines the day before, and how the miners rappel into dark, airless spaces to beat the face of a hard rock with a hammer for nine or ten hours before emerging, covered white with ore and coughing clouds of dust. "I don't know how," I responded, rather pathetically.

I don't imagine the miners in Essakane will remember me. Many consultants and experts pass through such mining regions, visiting the areas without ever really experiencing them. Lodging in a company's mining camp is like gated-tourism. There is electricity, potable water, Internet and television, medical care, a gym,

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and food and drink in abundance. These circumstances are not lost on those outside the fences of the camp, who see how roads, water pipelines, and power plants are built, but are not extended to their villages and towns. They see that mining corporations are able to establish the conditions for modern development in under a year, while they remain trapped in a lifetime of poverty.

The Missing Ethics of Mining

There is a maddening futility about speaking of "mining," as if it were singular or coherent. It is like talking about "Africa" or addressing the "international community" in the fashion of humanitarians, as if it is all one big thing. Rather, there are many mining industries, and each has its own culture, directives, structure, purpose, and pathologies.

Mining is the material basis for life, making it difficult to exaggerate its significance. George Orwell called it part of the "metabolism" of civilization. Major divisions of history are named in accordance with their dominant mineral products: the Paleolithic and Neolithic Periods; the Copper, Bronze, and Iron Ages. More than ever, humanity relies on minerals to sustain its existence. The growth of population, speed of transportation, proliferation of electronic gadgets and games, and delivery of electricity all depend on the expansion of mining. And yet we are ready to discuss almost any other ethics before the ethics of mining. Some view the concept as a contradiction in terms, others are alarmed that mining continues to exist at all, or simply find the topic supremely boring. We have more faith in our capacity to restrain or end violence and war than to address the ethics of mining. "A man does not advocate the sun or the moon," wrote Orwell's publisher, Victor Gollancz, in response to Orwell's suggestion in *The Road to Wigan Pier*, his 1937 book about the poverty of coal miners, that the defects of the extractive industries might be irremediable.

Orwell's book is among the last great literary efforts to reckon with the neglected relationship between mining and modern development. Curiously, when the postwar international environmental and development institutions were created, mining got left out. The topic does not figure in Agenda 21, the nonbinding, voluntary UN action plan for sustainable development that has guided environmental negotiations since the Rio conference of 1992. Its chapters on resource conservation include forests, atmosphere, ecosystem diversity, and nuclear waste, but not minerals and mining. The same is true for the earlier global plan

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from 1987, "Our Common Future," a policy manual intended to unify the international environmental and development agendas. If you follow the chain back to the UN's first global environmental gathering—the 1972 Stockholm Conference on the Human Environment, which led to the creation of the United Nations Environment Programme—the excellent book published to accompany that conference, *Only One Earth*, devotes just a few pages to resource extraction. One has to go back to 1949 and the United Nations Scientific Conference on the Conservation and Utilization of Resources to find minerals and mining included as part of global environmental and development ethics. That conference was divided into four categories: agriculture, forestry, fisheries, and minerals. To lecture on minerals, the United Nations invited Canada's Deputy Minister of Mines, Dr. Hugh Keenleyside. A historian and lifelong civil servant, Keenleyside's specialization was public administration, not minerals. But having served as Assistant Under-Secretary of State for External Affairs during World War II, he was conscious of how the world wars had depleted global mineral supply.

Prior to World War I, the United States produced 96 percent of the natural resources it consumed, but by the end of World War II, after supporting the allied forces with energy and minerals, it had become a net importer of most essential resources. "It is significant," Keenleyside said at the outset of his speech, "that in the cases of agriculture, forestry, fisheries, and certain other fields of resources development some progress has been made in the direction of conservation. All these are renewable resources. Yet in the case of minerals, which are not renewable, there has been practically no effort, except in time of war, to interfere with the free play of a market that is interested primarily in profits. This anomaly cannot continue indefinitely."

Keenleyside was a proponent of resource interdependence, which meant careful, internationally coordinated mineral extraction, a system he viewed as essential to preventing mineral supplies from being wasted again in "the barren struggles of war." But the more resource-dependent the world became in the postwar period, the less we examined the international relations of natural resources. I don't know why mining vanished from environmental and development ethics. Perhaps the idea was that resource extraction would be handled in a different policy sphere, or maybe there was an assumption that managing climate, forests, biodiversity, and other ecological stresses implied an inherent reckoning with the limits of extraction. If this was the case, it certainly has not worked. There remains no

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baseline for articulating, much less pursuing, principles of sustainable resource extraction. Instead, there is denial about the dilemma whereby even the technologies that we hope will help lead us toward a sustainable economy demand intensive expansion of extraction. I am thinking particularly of the lithium needed to be mined for batteries in hybrid vehicles, but this is just one example. While it was once relatively easy to count off the critical minerals and fuels (such as iron, copper, zinc, lead, tin, mercury, or coal), we now depend on at least ninety metals and mineral commodities to power and charge the global economy.[1] In the 1980s, Intel needed eleven minerals to manufacture its products; today it requires sixty.

In getting left out, mining also got left behind. One outcome of mining's omission from environmental and development ethics is that as other disciplines and sectors gradually integrated concerns about sustainability into their knowledge communities, mining engineering, mineral economics and processing, geochemistry, and other sub-disciplines associated with mining have remained static. As a result, there is less experience with the study and practice of sustainable mining than, say, forestry, agronomy, or soil ecology. There is no mining equivalent, for example, of the Yale School of Forestry & Environmental Studies. And while there is much anxiety about the failure to enact the ethics of climate change or environmental health, mining does not even have an ethical roadmap that we do not follow. With climate change there is broad agreement that exceeding a 2 degree Celsius rise in temperature breaks the planet. Pollution experts know to a microgram the tolerable level of exposure to mercury, lead, and arsenic. But what is expected of a mine?

Only in the last decade has vocal public discourse about global resource policy emerged. The effort to build an ethics of sustainable extraction is structured around two principal concepts: transparency and corporate social responsibility. While transparency initiatives concentrate on exposing revenue transactions between the private and public sectors in extractive industry projects, corporate responsibility efforts focus on the improvement of relations between companies and communities. The transparency movement has sparked advocacy and legislative activity in the United States, United Kingdom, and Canada—the host markets for much of the world's trading of mining shares. Meanwhile, companies are dedicating more staff and resources to ensure the benefits of mine development reach communities in the form of improved services, infrastructure, and education. These twin concepts are intended to transform resource extraction from a winner-takes-all model to one in which all parties benefit.

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The problem is that neither corporate responsibility nor transparency speaks to the reconciliation of extraction with ecological limits, or to the fact that we have entered a period of resource scarcity that necessitates nothing short of monopolization to make the business of industrial mining profitable. This order of magnitude leaves no room for multiple uses of land and resources, especially the smallholder farming and mining economies upon which people depend in mineralized places. Endemic poverty, conflict, and ecological collapse in these regions are rooted in the inequitable allocation of resources. In such cases, win-win solutions are an illusion. Somewhere in the equation, somebody has to give something up.

"There Are Houses, and There Are Houses"

No matter where you are in the world, it is hard to witness people losing their land, homes, work, or food. Essakane was not my first encounter with the conflict that occurs when a mining company takes over an area that is already inhabited by artisanal miners. In 2003, I traveled to the interior of Guyana, a country that is 80 percent tropical rainforest. The middle of the country is a savannah that separates the northern and southern forests. Looking out from a mountain top in the southern forest, it is nothing but jungle as far as the eye can see—an ocean of rainforest all the way to Brazil.

In the Marudi mountains I visited a group of artisanal miners whose houses had been burned to the ground by a Canadian exploration company. An exploration company—referred to as a *junior* in the industry—does not generally do much mining. Its role in the mining economy is to evaluate the strength of the deposit—the proven reserves. If it demonstrates that a formation can yield more than 200,000 ounces of gold per year, the assets will likely be sold to a bigger corporation—a *major*—that is better capitalized to front the early costs of assembling the mine before there is any profit. In addition to evaluating reserves, a *junior* needs to show the area is ready for mining. The presence of other miners already working the claim is a serious obstacle.

Many of the artisanal miners had lived and mined in these mountains for more than thirty years. Some were seasonal miners from Amerindian villages in the savannah who came to mine between periods of harvest and hunting. The area had been mined for at least a century, but never industrialized; the interior of Guyana still has few viable roads or bridges to cross the rivers. After their houses

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were burned, the miners and their families were loaded into a truck at gunpoint and taken off the mountain. The ones I met had come back a few weeks later, leaving their families in the savannah. They were sleeping in hammocks pitched under tarps. "They used self-loading rifles," a miner told me. He was smoking tobacco rolled in notebook paper. "They even burned our gardens."

The force used to clear the area was in preparation for a mine that did not yet exist. At the time, the company had only a skeletal staff on the site, led by a local Guyanese manager who was from a savannah town. He told me the houses had been destroyed but denied any personal involvement. A few days later he tracked me down in a different village. "I wanted you to know that I did it," he admitted. "It was wrong to burn their houses." But when I met the company's expatriate director in Guyana's capital, Georgetown, he insisted no incident had occurred. Even if it had, he told me, I needed to understand that it was inaccurate to equate thatched-roof dwellings with houses made of concrete and metal. In his words, "There are houses, and there are houses." Later, when I met with the Canadian High Commissioner in charge of the consulate in Georgetown, he tried to persuade me that I had convinced myself that this violence against the miners had occurred. I offered to show him film and photographs from the field, but he said he was out of time and walked me to the door.

Today, it is easier to appreciate that we are in the midst of a worldwide resource boom, but ten years ago there was virtually no media coverage about mineral resource extraction. Environmental and economic development organizations did not concentrate on mining. The topic was not fashionable among scholars, and fewer still followed the explosion of artisanal mining. The boom, not only in gold but in tin, copper, silver, and iron ore, among other minerals, is greater than the rushes of the 1850s and 1890s, and as significant as the production increases of the last century that were needed to support the two world wars. One hardly goes a week now without reading about untapped mineral deposits in the mountains of Afghanistan, child labor in the Congo's coltan mines, or copper extraction in Alaska. Before all this scrutiny, however, it was hard to interpret what was happening, much less comprehend that the connection among these conflicts is the pressure created by crossing a threshold of scarcity.

Guyana and Burkina Faso are hardly isolated instances. It is hard to identify a part of the world where resource extraction is expanding without conflict. There are the more well-known conflicts—for instance, the massacre of striking miners in South Africa in August 2012. But not two weeks before that massacre five

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people were killed by security forces at an iron mine in Guinea. (The company opening that mine has since withdrawn from Guinea altogether.) Over the last five years some 200 people have been killed in mining clashes in Peru;[2] and militias, paramilitaries, and guerrillas control mineralized parts of the Congo and Colombia, to name just a few hotspots. These conflicts are not only in distant developing countries, however. After years of exposure to toxic sour gases, people in northern Canada have sabotaged gas wells; and in the United States major protests are occurring over proposed pipelines in Texas and Nebraska.

Mining is an enterprise with no end to problems. As resources dwindle, the costs of extraction increase. This squeeze is especially profound for industrial operations. Miscalculation leads to ruin. If, say, there is more graphite or arsenic in the ore than projected and the chemical treatment process has to be redesigned, or an engineering error causes a wall to collapse, or if there is civil upheaval and conflict in the country in which the mine is located, investors can panic and the whole operation can fail. Corporations that seem invincible can suddenly disappear, if they are unable to bend chaos into order.

Technology and strategy cannot overcome the inevitable depletion of resources, but they can delay it. A hundred years ago mining companies looked for deposits whose percentage of gold per ton of earth—the grade—was at least one ounce. Today the grade is considered exceptional if it exceeds one gram per ton.[3] When the grade is low, the only way to continue mining profitably is to grow. A mine in the first half of the twentieth century might process 10 million tons of ore over a fifty year period. Now mines are processing 10 million tons each year. Today, industrial mines are designed to yield extraordinary returns, measured in both ounces and dollars. But this is only true because the magnitude is so extraordinary, and mining corporations are able to collect investment and secure the rights for mines as big as anything humans have ever built.

The magnitude is difficult to illustrate. A mine is not merely a hole in the ground. There are many pits covering a great area, such that it may take two or three days to tour the complex, and even then a visitor would not know all its dimensions. People seeing a mine of this scale often compare it to visiting the Grand Canyon. The first time I visited a tailings pond, where mines store the toxic waste that results from processing ore, I mistook it for a lake. The waste consumed a valley, nearly overflowing its dam. What is often difficult to grasp is that having taken this step there is no going back. A pit filled with toxic compounds does not merely revert to ecological equilibrium, it must be managed forever. A

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modern industrial mine is complete inversion: the earth turned upside down. Waste piles form new mountains, open pits become ravines.

The best way to reduce an investor's risk is for a given commodity to be valued as high as possible. Between 2001 and 2005 the price of gold rose from $250 to $700 an ounce. Initially, this ascent was explained by economists as a predictable, if questionable, return to gold as a hedge against global insecurity and post-September 11 fears that the U.S. dollar might collapse. In 2005, I interviewed a commodities analyst in Vancouver, a city that is home to the headquarters of many mining companies. (Canada houses 70 to 80 percent of all the mining companies in the world.) He told me he expected the price to climb over $2,000 an ounce. At the time, this struck me as absurd, but of course that is exactly what happened. Today we are in a bull run that George Soros—a major investor in gold—calls the world's "greatest asset bubble."[4]

For a decade now mining companies have been driving up the price of gold. The force beneath the bubble is the emergence of exchange-traded funds, a mechanism for selling gold as a mass investment by dividing bars into securities that can be traded on major stock exchanges. Until 2001 gold was promoted principally for its use in jewelry. In 2002 the World Gold Council—a consortium of major mining corporations—hired the management consulting firm Bain & Company to review its operations and develop ways to promote gold as an investment. One outcome of this process was the creation of the exchange-traded funds. These funds are now, combined, the world's fifth largest holder of gold, behind only the official reserves of the United States, Germany, Italy, and France. The largest of these funds is held by the World Gold Council. "Our primary mission was to find every button we could push to stimulate demand," James Burton, the Council's former CEO, told Bloomberg Business Week in December 2010. "We also knew that we had launched something that we could not control."[5]

Unanticipated Consequences

In July 2012, I had occasion to see what it means to lose control of the gold market. I visited the Ashanti Region in Ghana, an interior province where people are farmer-miners, combining cocoa and oil palm cultivation with seasonal alluvial and shaft mining. Villages are built along rivers and atop deep quartz reefs. The area is part of a goldfield that has been mined for ages, and includes the

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great Obuasi mine. Extending more than a kilometer underground, it has been mined steadily for over a century.

Ghana has participated in every significant development in gold mining since at least the eighth century, and was known among Arab scholars as the Land of Gold. "It is certain," wrote Roland Oliver and J. D. Fage in 1962, "that the wealth of Ghana, and of its successor empires in western Sudan, stemmed from its control of gold exports to the north and the distribution of salt and other imports in the south."[6] Since the 1890s two kinds of mining—industrial and artisanal—have persisted in parallel, with numerous cycles of decline and resurgence.[7] By law, Ghanaian nationals are permitted to lease twenty-five acre small-scale mining claims, tiny plots compared to the 200 square-kilometers needed to support an industrial mine. Most small-scale miners cannot afford heavy machinery; their mining is a mix of manual digging and semi-mechanized processing, using small diesel crushers and the outdated but inexpensive technique of mercury amalgamation.

In 2010, Chinese miners arrived in the region and introduced a hybrid model that combined mechanized industrial mining techniques with the mobility of small-scale mining. Under the best conditions industrial mines take years to become operational: one must raise capital, acquire property rights, and construct the mine. A twenty-five acre mine needs none of this preparation. It requires minimal knowledge or capital: an excavator and separator, a lot of diesel fuel and water, and a handful of workers. The risks are low. After clearing the forest and farms, you dig, wash, crush, and separate. If the spot you are exploiting is exhausted or a bust, you move to another claim.

But even with industrial machinery, it would be hard to sustain profit on a single claim for very long before needing to expand the mine; the mining is too superficial and the grade is too low. When the first scientific sampling was conducted in the Ashanti Region in 1885, studies revealed a grade of more than four ounces per ton.[8] Today, the reefs mined at Obuasi average five grams per ton, and the recovery rate from the surfaces mined by the Chinese is lower and less consistent than the reefs. If not for the exceptionally high price of gold, and the ruthless acquisition and consolidation of land, the new hybrid mining by the Chinese could not succeed. "They're cartels," a local land-use expert told me. "They enter the region as goods and services companies, and partner with Ghanaians who front the applications for the claims."

China's ascent as a global mining power has been the big story of resource relations for several years now. What most observers had anticipated, however,

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was a competition between industrial state-owned enterprises and Western corporations, and that the presence of China might embolden host countries to nationalize their resources, knowing they could then turn to the Chinese for a better deal. I don't know of anybody who predicted that a consequence of the rising price of gold would be Chinese miners mechanizing and infiltrating the artisanal mining sector in places such as Ghana.

The villages I visited in Ghana were enduring systematic abuse at the hands of the Chinese. Their farms had been bulldozed and moats dug around them to restrict access. Roads, essential for reaching markets, were flooded by streams re-routed for the mines. In the village of Keniago a man had recently been shot in the thigh while attempting to reach his farm. The villagers retaliated by setting fire to an excavator. The previous day I met a woman in Dunhura who had taken her complaints to the police, but instead found herself arrested. Some expressed hope they could be compensated, or that their farms, which were now lifeless lagoons, would be restored. Others argued it was too late for such remedies. "They are not going to leave," said one man. "We have to defend ourselves. We have to fight."

Outrage was boiling over. In village meetings, men pointed, yelled, and lunged at each other, fighting over who was to blame for permitting entry to the Chinese. "They are arguing about the chiefs," Gavin Hilson, an expert on Ghana's mining economy and Chair of Sustainability in Business at the University of Surrey, explained to me. One particularity of local custom is that it is not permitted to speak a bad word about a tribal chief. But land is allocated through the paramount chief, or *Omanhene*, and the hierarchy of sub-chiefs operating under the Ashanti King. "The Chinese could not be there unless they had the support of the chiefs," Hilson said.

It is not hard to understand the outrage I saw intensifying in Ghana. It was not only that people were being terrorized. Their villages are not self-sufficient: there are no fish left in the region's rivers, and farmland is increasingly scarce and infertile. People depend on their cash crops—cocoa and oil palm—to buy nearly all their food from the nearest city, Kumasi. Even the smallest fish, no bigger than a thumb, are purchased this way. Perhaps outrage is not the right word to describe the local reaction; perhaps panic is more accurate. Without farms, how would they eat?

Artificially inflating the price of gold was meant to prolong the lifetime of corporate mining operations, which are confronting diminishing grades and rising

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costs of energy and materials. Those implementing this strategy did not consider the effect it would have on local communities and the artisanal mining economy, or anticipate the invention of new forms of mining taking advantage of the record price of gold. Whether in Burkina Faso, Guyana, or Ghana, the thread connecting these conflicts is not merely a deficit of transparency or a need for more corporate social responsibility. It is, fundamentally, a problem of scarcity. A sane mining ethic would establish limits on prolonging extraction once the grade reaches an unsustainable level in an area, rather than continuing to expand as if the resource were infinite. Setting these limits would require interfering, as Dr. Keenleyside suggested more than sixty years ago, "with the free play of a market that is interested primarily in profits." Such interference, improbable then, is unimaginable now. Instead, the investor bubble driving this gold rush will stubbornly persist, while the ethics of mining remain nowhere to be found.

NOTES

[1] See "Minerals Yearbook: Volume I—Metals and Minerals," U.S. Geological Survey; minerals.usgs.gov/minerals/pubs/commodity/myb/.
[2] Alana Wilson, "Peru's Social Conflict is About More than Mining," *Fraser Forum*, September-October, 2012; www.fraserinstitute.org/uploadedFiles/fraser-ca/Content/research-news/research/articles/perus-social-conflict-is-about-more-than-mining.pdf. Also see Fiorella Triscritti, "More Gold or More Water? Corporate-Community Conflicts in Peru," Center for International Conflict Resolution, Columbia University, September 2012 (unpublished).
[3] The troy ounce used for gold is 31.1 grams.
[4] See Cam Simpson, "Soros Gold Bubble at $1,384 as Miners Push Buttons," *Bloomberg*, December 19, 2010; www.bloomberg.com/news/2010-12-20/soros-gold-bubble-at-1-375-has-miners-push-every-button-in-tale-of-tears.html.
[5] Ibid.
[6] Roland Oliver and J. D. Fage, *A Short History of Africa* (Baltimore, Md.: Penguin Books, 1962), p. 63.
[7] Raymond E. Dumett, *El Dorado in West Africa* (Athens, Ohio: Ohio University Press, 1998).
[8] Ibid.

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