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# Who Lit This Fire? Approaching the History of the Fossil Economy

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## ABSTRACT

Global warming projects new meaning onto the past two centuries: since the early nineteenth century CO<sub>2</sub> emissions have soared, driving humanity into an unprecedented crisis. This article outlines a historical research agenda for the study of the fossil economy as the main driver of this process. It argues for studying history in climate, as distinct from the preoccupation with how climate fluctuations have affected societies in the past. While narratives of “the Anthropocene” point to the human species as the agent of fossil fuel consumption, this article scents a narrower set of suspects. Study of colonial India and other parts of the British Empire demonstrate that imperial agents introduced large-scale extraction and combustion of coal in those areas but found the “natives” ill-disposed to the project. Turning to present-day India, I argue that inequality and capital accumulation should be in focus when studying the historical dynamics of our warming world.

The climate on planet Earth is a product of the past—but no longer of the very distant, geological, natural past counted in eons and eras. It is the accidental concoction of the past two centuries. By setting fossil fuels on fire, some humans have, in this short time, filled the atmosphere with an excess of carbon dioxide unprecedented in several millions of years, and at every given moment, it is this modern legacy that now warps our weather beyond recognition. The record heat of 2015 or 2016 or the year thereafter is the swelling sum of emissions made in a continuously burning past. The rise in temperature on Earth follows from the increasing concentration of CO<sub>2</sub>, which in turn is a function of cumulative emissions, all the carbon that has been released back

Many thanks to Alf Hornborg and William Sewell, as well as two anonymous reviewers, for comments on various versions of this article. Any remaining errors are my responsibility solely.

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2326-4462/2016/0302-0002\$10.00

into the atmosphere, from which it was tucked away underground for hundreds of millions of years: surely the most fateful fire ever started.<sup>1</sup>

One could, it follows, argue that outside of hard climate science, history should be the preeminent field for the study of global warming. Or, all research into the process should be inflected by historical consciousness—and to some extent it already is, since the object of inquiry is by definition one of change over time. In *The History Manifesto*, Jo Guldi and David Armitage point out that climate scientists “have unknowingly become historians” merely by asserting human origination; as their science progresses, and as the opportunities for averting truly catastrophic climate change recede by the day, they shuttle between past and future via a present that frays into both.<sup>2</sup> Change over time—the special expertise of the history discipline—is the order of the day, as the past two centuries sweep us up from behind like a landslide and push us toward a future of potentially insufferable conditions on Earth. Such is the gist of the message from thousands and thousands of climate scientists. But, one might ask: have historians responded to them?

This article outlines an agenda for research into the history of our changing climate. It begins by distinguishing this pursuit from a more established field of study: the impacts of climatic fluctuations on past societies. Some reasons for probing deeper into the history of climate are adduced, most of them boiling down to a simple question: who lit and spread this epochal fire? We hone in on the fossil economy as the general driver of climate change and then consider some actual cases from the annals of the British Empire, whose projection of steam power onto India and other colonies proved crucial to the diffusion of that peculiar kind of economy. We then return to some conceptual issues of historical responsibility and causality. “The Anthropocene,” now the generally accepted master concept for the study of climate change, identifies a universal species agent as the force behind the fire; a similar tendency inheres in the common argument that the Soviet Union and its satellite states were among the worst offenders ever. Against these expansive attributions of blame, the agenda sketched here is narrowed down at the top and illustrated, finally, with a return to the coal fires now rapidly expanding in India.

1. For some more extensive reflections on this historicity and temporality of climate change, see Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (London: Verso, 2016).

2. Jo Guldi and David Armitage, *The History Manifesto* (Cambridge: Cambridge University Press, 2014), 33. Climate change remains a key point of reference throughout the manifesto.

## FROM CLIMATE-IN-HISTORY TO HISTORY-IN-CLIMATE

So far, anthropogenic global warming has principally inspired research into the effect of nonanthropogenic global cooling on past societies. As a monument to what this kind of scholarship can achieve stands Geoffrey Parker's *Global Crisis: War, Climate Change, and Catastrophe in the Seventeenth Century*, an Olympian chronicle of how the Little Ice Age brought extreme chills, droughts, downpours, and other anomalies to the four corners of the world, thereby contributing—not as the sole cause, as Parker is at pains to emphasize, but as a spark or aggravating circumstance, and as the common global denominator—to famine, riot, plunder, rape, pogrom, regicide, civil war, dynastic war, religious war, and an endless catalog of other miseries from China to Sweden. A third of the human population might have perished in the bitter mayhem.<sup>3</sup> In another work in the same genre, *The Climate of Rebellion in the Early Modern Ottoman Empire*, which possibly lives up to its claim of being “the most detailed analysis of a major climate crisis yet,” Sam White zooms in on how the Little Ice Age played out in Anatolia and the Levant: while suffering from unprecedented drought and dearth, peasants were ordered to feed the war machine of the imperial state with ever-growing taxes.<sup>4</sup> The combination tipped them over the edge and into uprisings against tax collectors, unrestrained banditry, popular armies that rampaged through the countryside while adverse weather—caused by natural fluctuations in solar output and volcanic activity—continued to sap the foundations for agriculture. Previous scholars of the seventeenth-century Ottoman chaos have searched for explanations among rulers and subjects, without as much as looking at the climate in which they lived, but “sensitized as we are today” to the factor, such neglect appears astounding. “In a world now facing global warming, the significance of climate change on human affairs should be readily apparent.”<sup>5</sup>

This is the first historiographical revolution in a warming world: the study of climate in history.<sup>6</sup> It has been immensely facilitated by the work of climate scientists, who have handed over to historians whole archives of data—ice cores, tree rings, pollen and spores deposited in lakes—that tell previously unknown stories about when and where extreme weather events struck; these archives can

3. Geoffrey Parker, *Global Crisis: War, Climate Change, and Catastrophe in the Seventeenth Century* (New Haven, CT: Yale University Press, 2013).

4. Sam White, *The Climate of Rebellion in the Early Modern Ottoman Empire* (Cambridge: Cambridge University Press, 2011), 14.

5. *Ibid.*, 137, 298.

6. For a smorgasbord of approaches, see the forum in *Environmental History* 19, no. 2 (2014).

then be juxtaposed to letters and diaries, ships' logs and paintings and other sources historians are used to working with. Current warming can light up past events we thought we knew inside out. Spurred by the insight that this does indeed change everything, and with the newly opened archives, some aim to reconstruct the whole arc of human history as a long dance with the ups-and-downs of climate, from the settling of the Nile Delta via the decline of the Roman Empire to the Enlightenment and onward.<sup>7</sup>

Such history has its pitfalls and limitations. One is the old specter of climate determinism. In an essay in *Proceedings of the National Academy of Sciences*, seven researchers correlate variations in temperature with "periods of harmony and crisis" in the northern hemisphere before 1800, throwing into their models such variables as population size, nutritional status, migration, epidemics, and war, concluding that "climate change was the ultimate cause of human crisis in pre-industrial societies."<sup>8</sup> But that is written by a team of geographers; neither Parker nor White can be accused of toying with monocausal explanations—to the contrary, their works trace the impacts of climate change as differentially articulated through the social relations of the seventeenth century. Here the problem is another.

Parker, for one, is interested in how humans can learn to adapt to hostile climate and "prepare for *long-term* recovery" after a disaster.<sup>9</sup> His study is a sobering lesson in all that can go wrong when the climatic rug is pulled from under civilization; framed by reflections on the extreme weather of today, it counsels us to adjust wisely. But what if adaptation to—let alone long-term recovery in—a world of, say, more than 2°C is plainly impossible, particularly for the vast majority of the human population that resides outside of centers of comforting affluence? Then other lessons might be in greater demand. Moreover, some of Parker's comments can be read as suggesting that catastrophic global warming is destined to happen, itself beyond the remit of historical research: "The critical issues are not *whether* climate change occurs, but *when*; and whether it makes better sense for states and societies to invest money now to prepare for natural disasters that are inevitable—hurricanes in the Gulf and Atlantic coasts of North America; storm surges in the lands around the North Sea; droughts in Africa;

7. See, e.g., Wolfgang Behringer, *A Cultural History of Climate* (Cambridge: Polity, 2010).

8. David D. Zhang, Harry F. Lee, Cong Wang, et al., "The Causality Analysis of Climate Change and Large-Scale Human Crisis," *PNAS* 108, no. 42 (2011): 17301.

9. Parker, *Global Crisis*, 693.

prolonged heat waves—or instead wait to pay the far higher costs of inaction—inaction, that is, in the sphere of adaptation, not mitigation.”<sup>10</sup>

But this is to abdicate from the central task of historians in a warming world. That should be to study history in climate. Many reasons could be adduced for the pursuit; four immediately strike the eye. First, since we know that there was never anything inevitable about this fire—it was created, not deliberately but actively, by human beings over the past two centuries: this is the alfa and omega of the science—and since the scenario of continued business-as-usual must be deemed intolerable, pushing us toward considering all means necessary for ejecting fossil fuels from the world economy, we would want to know what social forces introduced and expanded their consumption.<sup>11</sup> It could make the struggle against them easier. Second, the history of global warming is also the history of alternatives to spiraling combustion discarded along the way. Knowing about these might help in the search for exit strategies.<sup>12</sup>

Third, and perhaps most strangely overlooked, climate politics has been bogged down in a debate over historical responsibility: rarely have issues of the past proved so divisive for so long in so highly profiled international negotiations. The United Nations Framework Convention on Climate Change (UNFCCC) famously enshrines the principle of “common but differentiated responsibility”—meaning that some countries have done more than others to create the problem—but what exactly this implies and how it should be translated into obligations for cutting emissions, or financing adaptation, or compensating the victims, have been bones of interminable contention. Values of justice are at stake here. Since a few rich countries account for the bulk of cumulative emissions, should they not shoulder a proportionate burden for cleaning up the mess? Surely all human beings have the same right to use the atmosphere as a sink for CO<sub>2</sub>, but some have obviously used up far more than their fair share—so have they not accumulated a debt to those who have consumed less or nothing at all? If so, should they not cut their emissions so dramatically as to turn them negative, while others are

10. *Ibid.*, xxxii; cf. 689–96. For a similar focus on adaptation in other agendas for climate history, see Georgina H. Endfield, “Exploring Particularity: Vulnerability, Resilience, and Memory in Climate Change Discourses,” 309; Lawrence Culver, “Seeing Climate through Culture,” 316; and Sherry Johnson, “When Good Climates Go Bad: Pivot Phases, Extreme Events, and the Opportunities for Climate History,” 334, all in *Environmental History* 19, no. 2 (2014).

11. One attempt along these lines is Malm, *Fossil Capital*.

12. As stressed by Guldi and Armitage, *History Manifesto*, 30–31, 35, 68–69. A most fascinating episode is recovered in Vicky Albritton and Fredrik Albritton Jonsson, *Green Victorians: The Simple Life in John Ruskin’s Lake District* (Chicago: University of Chicago Press, 2016).

allowed to emit a bit more, and bankroll the necessary adaptation and pay for the unavoidable loss and damage they have inflicted on the blameless poor? Or is it the other way around: perhaps these pioneers did a service to the rest of humanity by initiating the rapid development that fossil fuels alone made possible? Should not the latecomers, then, rather be grateful for the living standards to which they have been invited?<sup>13</sup>

While policy makers, activists, and moral philosophers continue to wrangle and ruminate over these issues and others no less thorny, natural scientists have come up with raw numbers. We know, for instance, that the Organization for Economic Cooperation and Development (OECD) countries put up 86 of the 107 parts per million by which the CO<sub>2</sub> concentration rose from 1850 to 2006.<sup>14</sup> As of the year 2000, the advanced capitalist countries of the North held 16.6 percent of the world population but were responsible for 77.1 percent of the CO<sub>2</sub> pumped out since 1850; the share of the United States alone stood at 27.6 percent, while Nigeria had a paltry 0.2 percent, Turkey 0.5 percent, Indonesia 0.6 percent, Brazil 0.9 percent—these being countries with a historical responsibility sufficiently large to make it on a top-20 list. Most left even smaller marks.<sup>15</sup> Counting only from 1990, by far the largest debts have been accumulated by the United States, followed by Russia, Canada, Germany, and the United Kingdom, while the biggest creditors—that is, countries with large populations emitting less than their per capita shares—were, on top, India, then China, Bangladesh, Pakistan, and Nigeria.<sup>16</sup> Sixty-three percent of the cumulative emis-

13. For some contributions to the debate, see Tom Athanasiou and Paul Baer, *Dead Heat: Global Justice and Global Warming* (New York: Seven Stories Press, 2002); Andrew Simms, *Ecological Debt: The Health of the Planet and the Wealth of Nations* (London: Pluto, 2005); J. Timmons Roberts and Bradley C. Parks, *A Climate of Injustice: Global Inequality, North-South Politics, and Climate Policy* (Cambridge, MA: MIT Press, 2007); Steve Vanderheiden, *Atmospheric Justice: A Political Theory of Climate Change* (New York: Oxford University Press, 2008); Eric Neumayer, "In Defence of Historical Accountability for Greenhouse Gas Emissions," *Ecological Economics* 33, no. 2 (2000): 185–92; Simon Caney, "Justice and the Distribution of Greenhouse Gas Emissions," *Journal of Global Ethics* 5, no. 2 (2009): 125–46; Christian Baatz, "Responsibility for the Past? Some Thoughts on Compensating Those Vulnerable to Climate Change in Developing Countries," *Ethics, Policy and Environment* 16, no. 1 (2013): 94–110; Rikard Warlenius, Gregory Pierce, and Vasna Ramasar, "Reversing the Arrow of Arrears: The Concept of 'Ecological Debt' and Its Value for Environmental Justice," *Global Environmental Change* 30 (2015): 21–30.

14. P. Ciaia, T. Gasser, J. D. Paris, et al., "Attributing the Increase in Atmospheric CO<sub>2</sub> to Emitters and Absorbers," *Nature Climate Change* 3 (2013): 926–30.

15. Michel G. J. den Elzen, Jos G. J. Olivier, Niklas Höhne, and Greet Janssens-Maenhout, "Countries' Contribution to Climate Change: Effect of Accounting for All Greenhouse Gases, Recent Trends, Basic Needs and Technological Progress," *Climatic Change* 121, no. 2 (2013): 397–412.

16. H. Damon Matthews, "Quantifying Historical Carbon and Climate Debts among Nations," *Nature Climate Change* (2015): 1–6, <http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2774.html>.

sions between 1751 and 2010 can be traced to 90 corporations in the business of extracting fossil fuels.<sup>17</sup>

As useful as these figures are, and as much as one would wish to see more of them—notably on the responsibilities and debts of classes—they can come across as somewhat stylized and anemic.<sup>18</sup> They do not convey the dynamics of the history in question. No numbers can capture its texture, lay bare processes of causation, specify who did what for what reasons and in the service of whom to set the world on the path to this blaze: only historical narrative and analysis could accomplish that. And yet historians have been conspicuous by their absence from the debate.

Fourth, even if there were to be no meaningful mitigation, no exit, no comprehensive international agreement effectively implemented—no measures, in short, to reign in business as usual—there presumably would still be some interest in the question of how humanity ended up on an unlivable planet. The first, third, and fourth of these reasons could be somewhat crudely summed up: who lit and spread the fire of the fossil economy from the time of the Industrial Revolution up to the present—why, where, and how?

We are dealing with a historicized climate, a biosphere that carries the imprint of what some have done in the past, and it is their momentous course of action that needs to be retraced. Such a move from climate-in-history to history-in-climate, toward a second historiographical revolution, would lead to another methodological imperative, taking data on empires and industries to temperatures and precipitation, rather than the other way around. In the Ottoman Empire, to stick with that case, this could mean an investigation into how its lands were subsumed under an economy that grew by burning coal; here the crucial events would be not the Celali rebellion or the lynching of Ahmed Pasha but the Balta Liman treaty of 1838, the British-Egyptian war of 1840, the Crimean War, the European loans; not the outbreak of drought but the arrival of the steam engine. Not the seventeenth century but the nineteenth and its successor century would be in focus.<sup>19</sup> In a world facing global warming, the signifi-

17. Richard Heede, "Tracing Anthropogenic Carbon Dioxide and Methane Emissions to Fossil Fuel and Cement Producers, 1854–2010," *Climatic Change* 122, no. 1 (2014): 229–41.

18. A more qualitative historical approach, targeting fossil fuel corporations for their sabotage of climate change mitigation, is on offer in Peter C. Frumhoff, Richard Heede, and Naomi Oreskes, "The Climate Responsibility of Industrial Carbon Producers," *Climatic Change* 132, no. 2 (2015): 157–71.

19. Needless to say, the explosion of fossil fuel combustion in the nineteenth century had its roots in previous epochs that also need to be traced. For some reasons to date the qualitative leap to this century, see Malm, *Fossil Capital*.

cance of how fossil fuels first came to be combusted on a large scale, and how this habit spread unevenly across the world, should be readily apparent.

### THE FOSSIL ECONOMY AS OBJECT OF STUDY

The spiral of climate change is set in motion by the act of identifying, digging up, and setting fire to fossil fuels: this is the axis around which the process revolves. Put differently, the fundamental historical fact of global warming is the commencement of large-scale consumption of those fuels, something truly new under the sun. For most of human history, the deposits were left untouched, safely locked out from the active carbon cycle. Then a qualitatively novel type of economy irrupted into them. We shall call it the “fossil economy,” most simply defined as one of self-sustaining growth predicated on the growing consumption of fossil fuels and therefore generating a sustained growth in CO<sub>2</sub> emissions.<sup>20</sup> It is flanked by other processes (notably deforestation) and other greenhouse gases (methane, nitrous oxide, sulfur hexafluoride, etc.), but there can be little doubt about its principal culpability.

Once the fireplaces were built, they were augmented and reinforced, stone upon stone; no less than the altered atmospheric composition as such, it is this earthly legacy that constrains the present and future. In its latest report, the Intergovernmental Panel on Climate Change (IPCC) warns about “the *tendency for past decisions and events to self-reinforce*, thereby diminishing and possibly excluding the prospects for alternatives to emerge.”<sup>21</sup> Once a highway or a coal-fired power plant is built, it is meant to last for many decades; there are profits to be reaped from long usage; consumers become accustomed to the convenience; planning, advertisement, trade, subsidies, and investment conspire to lock in the infrastructure and, rather than shelve it, enlarge it further. Alternatives tend to be closed off, the power of the past to grow, emissions to spur emissions.<sup>22</sup>

If it emerged in the early nineteenth century, the fossil economy has since spiraled on unabated. But the disclosure of its real import is of a recent date and, as a quick glance at any journal of climate science will make clear, still very much unfinished: “One might say that this development,” to amend Walter Benjamin,

20. See further, *ibid.*

21. O. Edenhofer, R. Pichs-Madruga, Y. Sokona, et al., *Climate Change 2014: Mitigation of Climate Change: Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2014), 312; emphasis added.

22. See, e.g., Peter Erickson, Sivan Kartha, Michael Lazarus, and Kevin Tempest, “Assessing Carbon Lock-In,” *Environmental Research Letters* 10 (2015): 084023.



“occurred *behind the back of the last two centuries*, which were not yet aware of the destructive energies of technology.”<sup>23</sup> When natural scientists reveal one unexpected effect after another, they write out an ever-lengthening request to historians for research—or, to borrow another metaphor from Benjamin: historical knowledge should take the shape of balanced scales, one tray weighted with the past and the other with the present (and the future). On the second tray, there is now the ponderous fact of global warming. On the first, the facts—and they “can never be too humble or too numerous”—remain to be assembled in anything like a matching weight.<sup>24</sup>

We might have thought that the past two centuries were fairly well covered, but if what may well be their most devastating consequences played out behind their backs, in abeyance, we need to revisit this past with them in mind.<sup>25</sup> An event like the carving up of the Ottoman Empire into Western zones of dominance, where oil was discovered and drilled, can now be flipped over, its atmospheric face upward—not merely because CO<sub>2</sub> from that very oil makes up a tranche of the cumulative emissions changing the climate of today (and tomorrow) but also because that event consolidated the fossil economy. The exploitation of Middle Eastern oil locked in CO<sub>2</sub>-intensive infrastructure on unprecedented scales, from the Bay Area to the Gulf, increasing the weight of this peculiar economy by orders of magnitude. Only the history of that totality can be written. No single impact, no one heat wave or extinct species can be causally linked to the burning of a specific barrel of oil or cubic feet of gas, for every molecule of CO<sub>2</sub> mixes in the air and acts upon the earth together with every other, in the aggregate. The events of the past two centuries are of interest as moments in the development—in all its dimensions, including political, ideological, cultural—of the fossil economy as a whole.

To get closer to it, we need to dip at least a toe in the annals of that totality. Here the choice has fallen on some episodes from the British Empire, beginning with the nation to which the over-emitters seem to owe their greatest debt: India.

## COAL COMES TO INDIA

In the second quarter of the nineteenth century, following the occupation of Assam in 1825, the British Empire resolved to fill the rivers of India with steam-

23. Walter Benjamin, *Selected Writings: Volume 3, 1935–1938* (Cambridge, MA: Harvard University Press, 267). The original has “the last century, which was not yet aware”; emphasis added.

24. Walter Benjamin, *The Arcades Project* (Cambridge, MA: Harvard University Press, 2002), 468.

25. Compare Fredrik Albritton Jonsson, “A History of the Species?,” *History and Theory* 52, no. 3 (2013): 464.

boats. These vessels of the new age would serve the Raj in several ways. Independent of winds and currents, they could ferry treasure—that is, chests containing revenues extracted from peasants—with greater speed, safety, and protection from marauding robbers. Remittances from private merchants were likewise expected onboard. Commanders, collectors, and other colonial personnel could tour territories and establish a permanent presence much easier by steam than by sail; troops might be swiftly dispatched in cases of emergency. Last but not least, the representatives of the metropolis saw before them a subcontinent finally opened to commerce, its rivers “turned into great steam highways for bringing cotton and other products of the interior to the coast, and for transmitting English manufactures in return,” at one stroke supplying Britain with an abundance of raw materials—apart from cotton also silk, indigo, hemp, timber, rice, opium, tea—and a teeming market on which the surplus of manufactured goods could be dumped.<sup>26</sup>

But steamboats required fuel. Coal had been dug up by a couple of pioneers from the East India Company in the 1770s, without enduring results. In the 1810s, an entrepreneur by the name of William Jones opened the Raniganj mine in Bengal—today the longest continuously operating coalfield in India—and thereby earned himself the honor of being “the first who ever brought Indian coal into the general market.”<sup>27</sup> Yet Jones was also ahead of his time. Dying a broken man in 1822, he “knew little,” one authority on Indian commerce later noted, “of the great revolution steam was destined to effect, nor of the imperative necessity of

26. John Bourne, *Indian River Navigation: A Report Addressed to the Committee of Gentlemen Formed for the Establishment of Improved Steam Navigation upon the Rivers of India* (London: W. H. Allen & Co., 1849), 6. See further, British Library, India Office Records, Bengal Public Consultations, July 17–August 21, 1828, and L/MAR/C/590, “Report on the River Steam Navigation in Bengal by Captain Johnston,” January 1837; G. A. Prinsep, *An Account of Steam Vessels and of Proceedings Connected with Steam Navigation in British India* (Calcutta: Government Gazette Press, 1830); James H. Johnston, *Précis of Reports, Opinions, and Observations on the Navigation of the Rivers of India* (London, 1831); *Oriental Inland Steam Company, Indian River Navigation: Selections from the London and Provincial Newspapers* (London: W. H. Allen & Co., 1850); Henry T. Bernstein, *Steamboats on the Ganges: An Exploration in the History of India’s Modernization through Science and Technology* (Bombay: Orient Longmans, 1960); Satpal Sangwan, “Technology and Imperialism in the Indian Context: The Case of Steamboats, 1819–1839,” in *Science, Medicine, and Cultural Imperialism*, ed. Teresa Meade and Mark Walker (Hong Kong: Macmillan, 1991), 60–74. On the 1820s as the watershed in British attempts to penetrate the interior of India by steam, see also Nitin Sinha, *Communication and Colonialism in Eastern India: Bihar, 1760s–1880s* (London: Anthem Press, 2014).

27. Thomas Oldham, *Memoirs of the Geological Survey of India, Vol. III* (Calcutta: Government of India, 1865), 156. See further, J. D. Herbert, “Notice on the Occurrence of Coal, within the Indo Gangetic Tract of Mountains,” *Asiatic Researches* 16 (1828): 397–408; L. J. Barraclough, “Early Development and Coal Mining,” 141–46; and H. D. G. Humphreys, “The Early History of Coal Mining in Bengal,” 147–59, both in *Progress of the Mineral Industry of India, 1906–1955*, ed. Mining, Geological, and Metallurgical Institute of India (Calcutta, 1955).

an abundant and cheap supply of coal for commercial and industrial prosperity.”<sup>28</sup> That revolution came roaring with the steamboats in the decade after Jones’s death. Production at Raniganj now accelerated to feed the ships, and in the mid-1830s a first Coal Committee fanned out into the hills and jungles to track down hidden reserves, followed by several surveys in the 1840s; all officers of the Raj were instructed to keep their eyes open.<sup>29</sup> In this moment of history, coal suddenly became the most highly prized resource of the Indian soil.

Some rather astounding reports reached the East India Company’s Calcutta government. In the Khasi Hills, local tribes were in the habit of manufacturing “Coal-tar, Beads, and Amulets” out of coal. But they had no interest in exploiting the deposits on a large scale: apparently, and incomprehensibly, they were content with the life they led.<sup>30</sup> In another district, a surgeon reported,

there are large and very extensive iron works, employing a great many persons, and yet strange to say, though most of the inhabitants are aware of the existence of this extensive coal bed, they never use it for their furnaces, but are at great expense in transporting wood and charcoal from the forests, several miles distant. I endeavoured to impress upon some of the workmen how advantageous it would be, and what a saving would accrue to them were they to use this coal, but by their answers they evinced their utter indifference to the subject, and their determination to adhere to the customs of their fathers. The coal bed is not above a mile distant from the works.<sup>31</sup>

There are other indications that people in India were indeed well aware of the riches underground—the river Damodar runs through several Bengali coal districts:

28. George Watt, *The Commercial Products of India* (London: John Murray, 1908), 334.

29. “Reports of a Committee for Investigating the Coal and Mineral Resources of India,” *Madras Journal of Literature and Science*, no. 20 (July 1838): 158–96; Cyril S. Fox, “The Geological Survey of India, 1846 to 1947,” *Nature* 160 (December 27, 1947): 889–91; Satpal Sangwan, “Reordering the Earth: The Emergence of Geology as a Scientific Discipline in Colonial India,” *Indian Economic and Social History Review* 31, no. 3 (1994): 291–310; Deepak Kumar, *Science and the Raj: A Study of British India*, 2nd ed. (Delhi: Oxford University Press, 2006), 45; Clive Dewey, *Steamboats on the Indus: The Limits of Western Technological Superiority in South Asia* (Oxford: Oxford University Press, 2014), 63; Bernstein, *Steamboats*, 115–17; Sinha, *Communication and Colonialism*, 53–55.

30. British Library, India Records Office, *Reports and Abstracts of the Proceedings of a Committee for the Investigation of the Coal and Mineral Resources of India, Brought Up to May 1841* (Calcutta: Bengal Military Orphan Press, 1841), 14.

31. British Library, India Records Office, *Report of a Committee for the Investigation of the Coal and Mineral Resources of India, for May, 1845* (Calcutta: Bengal Military Orphan Press, 1846), 166.

the name means “fire in the belly”—but even so, no systematic extraction occurred before the Raj.<sup>32</sup> The introduction of river steamboats called the Indian coal industry into existence. Production at Raniganj more than quadrupled between the mid-1820s and mid-1840s, the Company steamers the most important customers by far; when setting out for a river journey, they were normally packed with 18 tons of Bengali coal to burn. Depots for refilling lined their routes. Among the decaying monuments of Rajmahal, one British visitor could discern an unmistakable token of progress: a marble hall having been “converted into a coal-hole for the supply of the Government steamers plying up and down the Ganges.”<sup>33</sup> As the vessels were launched for two general purposes—stabilizing control over the subcontinent and draining it of wealth—exploration continued in search of yet more seams and led the Raj to announce an epochal achievement:

Within a few years after the first discovery of the mineral in India, it has been traced through fifteen degrees of longitude, almost in a direct line from the eastern side of the valley of Assam, through Sylhet and Bengal, to the confines of the Hyderabad territory: we may now consider the supply to be inexhaustible, and look to it as a resource for firing, and for many branches of manufacturing industry, as well as for steam navigation,—a resource, the nature and value of which were entirely unknown before the establishment of our dominion in the country.<sup>34</sup>

The railway networks established from the 1850s onward—largely in response to the Great Rebellion of 1857—proved rather more effective tools of control and drain and sparked a coal boom of another magnitude. By 1860, 42 collieries operated on the Raniganj field, output having increased by a factor of twenty in three decades; between 1861 and 1866, the amount of Indian coal burned on the railways more than quintupled, steam on rail supplanting steam on rivers as the main source of demand.<sup>35</sup> But who would go underground to bring forth all of

32. Humphreys, “The Early History,” 147; cf. Kuntala Lahiri-Dutt, “Introduction to Coal in India: Energising the Nation,” in *The Coal Nation: Histories, Ecologies, and Politics of Coal in India*, ed. Kuntala Lahiri-Dutt (Farnham: Ashgate, 2014), 10–11.

33. Thomas Bacon, *First Impressions and Studies from Nature in Hindostan* (London: W. H. Allen, 1837), 265. See further Blair B. Klin, *Partner in Empire: Dwarkanath Tagore and the Age of Enterprise in Eastern India* (Berkeley: University of California Press, 1976), 94–112; Bernstein, *Steamboats*, 84–85, 116.

34. Prinsep, *An Account*, 103–4.

35. J. P. Kennedy, “The Strategic and National Importance of Extending Railway Communication throughout the British Colonies, more Especially throughout India,” *Journal of the Royal United Services Institution* 2, no. 5 (1858): 62–86; Oldham, *Memoirs*, 160, and “Memo on the Coal Resources and Production of India,” in *Selections from the Records of the Government of India, Home Department* (Calcutta: Office of

this fuel? Herein lay the greatest obstacle to even larger production. In the case of the tribes of the Khasi Hills, “on whom the burden of the experiment will literally fall,” the reporter saw a race “little accustomed to labour” and predicted difficulties in “reconciling a sufficient number of them to a continued effort, the object and importance of which they can be so little expected to understand.”<sup>36</sup> This was the common situation facing the Raj: the people inhabiting the coal districts had no desire to go into pits. Hence there developed an arrangement whereby investors in mines—from midcentury, exclusively British capitalists—purchased so-called zamindari rights to vast tracts of surrounding land. As landowners, they could then force peasants and other villagers to perform a certain quantum of labor in the mines, on pain of expulsion from their homes.<sup>37</sup> By such means, the emerging industry succeeded in recruiting labor—but of a substandard quality.

In 1869, Mark Fryar, the chief mining engineer of the Raj, circulated *A Letter to the Proprietors and Managers of the Coal Mines in India* outlining the pressing problem. When describing the primitive conditions of work, he noticed the extreme heat to which the miner was subjected. It rose even further every time a sahib descended, since the miner had to carry a large torch to light up his way: “this, connected with the heat of the stagnant air of the mine, raises one’s blood and temper to a temperature somewhere very near the boiling point.” On any morning, the managers might find their mines deserted. The hands would “go to their work and leave it just at such times as suit their own convenience, and during the harvest time many of them leave their work for weeks”; most wayward of all were the women who worked the machinery for raising coal to the surface. This situation threatened the Raj with embarrassment or worse, for in times of war or unrest “the prompt exercise of power might be very seriously interfered with by a deficiency in the supply of coal.” As the only practical solution, Fryar recommended tighter bondage. There ought to be some “very strict” laws “binding the miners for at least twelve months at each colliery, and

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Superintendent of Government Printing, 1868), no. 64, 66–67; Barraclough, “Early Development,” 145; Daniel Houston Buchanan, *The Development of Capitalistic Enterprise in India* (London: Frank Cass, 1966), 256–64; David Washbrook, “The Indian Economy and the British Empire,” in *India and the British Empire*, ed. Douglas M. Peers and Nandini Gooptu (Oxford: Oxford University Press, 2012), 56–58.

36. British Library, India Records Office, *Reports and Abstracts . . . 1841*, 27.

37. Oldham, “Memo,” 42, and *Memoirs*, 171; Buchanan, *The Development*, 270–72; Simmons, “Recruiting and Organizing and Industrial Labour Force in Colonial India: The Case of the Coal Mining Industry, c. 1880–1939,” *Indian Economic and Social History Review* 13, no. 4 (1976): 455–85.

heavy penalties inflicted for the violation of such bonds.”<sup>38</sup> And indeed, a reasonably stable mining workforce could only be gradually molded through the constant application of extra-economic coercion over more than a century of British efforts to conjure the industry out of the ground.<sup>39</sup>

#### IT SEEMS ONLY NECESSARY TO SEEK, AND MINERAL IS FOUND

In some places, the discovery of coal precipitated colonial occupation as such. In the 1830s, but particularly in the wake of the Opium War—itself won with the celebrated contribution of the *Nemesis* and other coal-fired warships—British steamers began to frequent the China Seas, flashing their guns and carrying mail, opium, and other profitable commodities. But they remained cumbersome dependent on coal from Raniganj or the distant homeland. In 1837, however, a British missionary stumbled upon coal on Borneo and set off a frantic search for the mineral on that vast island, fortuitously placed “in the direct highway to China.”<sup>40</sup> The most promising riches were soon located on Labuan, a small island off the northern tip of Borneo, where thick veins of coal cropped out only a stone’s throw from the sea. Natives of Labuan evidently knew of the seams, having scratched some on the surface, but the bulk had been left untouched for the British to map and lay their hands on. After tests onboard the *Nemesis*, the engineers of the Royal Navy judged the material “the best coal for steaming purposes which they have met with in India.”<sup>41</sup>

Following an intense lobbying campaign from the Manchester and Glasgow chambers of commerce, in November 1846 Lord Palmerston instructed squadrons stationed in Singapore to take possession of Labuan. There was, of course,

38. Mark Fryar, *Coal Mining in India: A Letter to the Proprietors and Managers of the Coal Mines in India* (London: W. M. Hutchings, 1869), quotations from 31–34.

39. See Simmons, “Recruiting.”

40. Letter from Mr. Wise to Captain Sir Edward Belcher at Sarawak, London, June 30, 1843, in *A Selection from Papers Relating to Borneo* (London: Robsyn, Levey, and Franklyn, 1846), 9, and see further, e.g., 19, 37–43; “Excerpta,” *Asiatic Journal* (October 1842): 199–201; Peter Adam Shulman, “Empire of Energy: Environment, Geopolitics, and American Technology before the Age of Oil” (PhD thesis, Massachusetts Institute of Technology, 2007), 34–36.

41. Rodney Mundy, *Narrative of Events in Borneo and Celebes, Down to the Occupation of Labuan. Vol. II* (London: John Murray, 1848), 347. See further letter from Mr. Brooke to Mr. Wise, Labuan, October 31, 1844, in *A Selection from Papers*, 68–71; F. E. Forbes, *Five Years in China: from 1842 to 1847. With an Account of the Occupation of the Islands of Labuan and Borneo by Her Majesty’s Forces* (London: Richard Bentley, 1848), 310–23; Hugh Low, *Sarawak; its Inhabitants and Productions* (London: Richard Bentley, 1848), 12–16; Cuthbert Collingwood, “On some Sources of Coal in the Eastern Hemisphere, namely Formosa, Labuan, Siberia, and Japan,” *Quarterly Journal of the Geological Society* 24 (1868): 98–102.

the alternative option of inducing “the natives themselves to collect and store” and deliver the fuel in requisite quantities, “but from the natural indolence and apathy of all the Indian islanders, I do not think it would be safe to allow steamers to be entirely dependent on their exertions,” warned the governor of Singapore—or, in the candid words of the first governor of Labuan: “to do any good, the natives must be controlled.”<sup>42</sup> The British flag was hoisted on the island in a ceremony on Christmas Eve, marines arrayed on the beach, and natives gathered to marvel at the spectacle. The *Singapore Free Press* articulated the expectations aroused by the new colony: “A settlement at Labuan will almost perfect the chain of posts that connects, by means of steam navigation, Southampton with Victoria in Hong Kong. . . . We already have bound British North America, the West Indies, Ceylon, and India, to the dominant country by steam navigation. We are now riveting China by the same bounds, and are about to open out the Indian Archipelago to commerce, civilisation, and Christianity, by the like agency. . . . Thus in a very few years we may expect to see the world fairly *belted* by the steam navy to England.”<sup>43</sup>

Thus the British Empire established its first bridgehead in northern Borneo.<sup>44</sup> Indeed, Labuan was conceived as the entry point into the mainland of that island, which “appears to be one great coal-field, for every large river intersects a coal-bed; and it seems only necessary to seek, and mineral is found.”<sup>45</sup> Strangely, the population of Borneo appeared totally indifferent to that treasure. In the eyes of the British, it was “far more important and valuable, indeed, than gold”—but it “is nothing to the inhabitants or their prince.”<sup>46</sup> Just as on the subcontinent, the Empire introduced the very practice of large-scale coal extraction in the Malay Archipelago, including what is today Indonesia; from Labuan, 1,000 tons a month were delivered to steamers by the mid-1850s.<sup>47</sup>

42. Letter from the Hon. S. G. Bonham to Mr. Maddock, October 11, 1841, in *A Selection from Papers*, 32; letter from James Brooke to Mr. Wise, October 31, 1844, 69. See further the memorials from the chambers of commerce, 91–96; W. H. Treacher, *British Borneo: Sketches of Brunei, Sarawak, Labuan, and North Borneo* (Singapore: Government Printing, 1891), 86.

43. The Singapore Free Press, “A New British Settlement,” October 16, 1845 (article reprinted from *The Atlas for India*). Compare, e.g., “Notes for a British Settlement on the North-west Coast of Borneo,” July 10, 1844, in *A Selection from Papers*, 43–48; *Manchester Guardian*, “The Eastern Archipelago,” February 14, 1849.

44. See further L. R. Wright, *The Origins of British Borneo* (Hong Kong: Hong Kong University Press, 1970).

45. *Allen’s Indian Mail*, “Coal-fields of the Archipelago,” April 29, 1856.

46. “Notes for a British Settlement,” 46; cf. Low, *Sarawak*, 159.

47. Shulman, “Empire of Energy,” 54.



Before long, however, the representatives of the Empire beat their heads against the usual wall in these tracts: labor. The natives proved “averse to take employment,” cutting the coal “in a desultory way, working perhaps for a fortnight, and going away for as long.”<sup>48</sup> In 1867, there were 600 laborers on the books at Labuan, but only half as many were at work at any given time. The only solution, again, was unfree or quasi-free labor: coolies from China and Bombay. But the manager of the mines complained about the former that “they worked with a bad feeling”—he experienced difficulties “in getting them to go down into the pits”—while the latter “were like children to manage.”<sup>49</sup> Because of the troubles in procuring sufficient amounts of disciplined labor power, the coal colony of Labuan failed to live up to its promises. In the late 1870s, the mines were abandoned.<sup>50</sup>

#### THE MOTOR AND THE METER OF ALL COMMERCIAL NATIONS

Victorian Britain scanned the planet for coal: on the opposite side of the Pacific, Vancouver Island mirrored Labuan in deposits perfectly placed for steamers.<sup>51</sup> From the southern tip of Africa, the eyes of the Empire carried the happy news that “the country in the vicinity of Natal produces abundance of this valuable article.”<sup>52</sup> So did, apparently, Trinidad and Tasmania, Newfoundland and New Zealand; from the Ottoman Empire, a consul called for capitalists to seize the fields left fallow by the inept Porte; following the Opium War, the delighted British discovered “that the quays of Nankin are stored with the finest native coal (as if stationed there to supply our invading steam-vessels).”<sup>53</sup> Specimens of the

48. The *London Standard*, “The China Steam-Ship and Labuan Coal Company,” August 16, 1867; letter from Rear-Admiral Austen to the Secretary to the Admiralty, June 24, 1850, *Correspondence Respecting the Eastern Archipelago Company, Presented to the House of Lords by Command of Her Majesty* (London: Harrison and Son, 1853), 23.

49. The *Daily News*, “China Steamship and Labuan Coal Company (Limited),” March 6, 1866. See further, *London Standard*, “Labuan,” December 16, 1868; Collingwood, “On some Sources,” 100; Wright, *The Origins*, 90.

50. Treacher, *British Borneo*, 90. On this as the main difficulty, see the lamentations of the chairman of the company in the *Daily News*, “China Steamship.”

51. Robert A. Stafford, *Scientist of Empire: Sir Roderick Murchison, Scientific Exploration and Victorian Imperialism* (Cambridge: Cambridge University Press, 1989), 74.

52. W. B. Boyce, *Notes on South-African Affairs* (London: J. Mason, 1839), 160.

53. Quotation from Roderick Impey Murchison, *Address Delivered at the Anniversary Meeting of the Geological Society of London, On the 17th of February, 1843* (London: Richard and John E. Taylor, 1843), 97. See further William Buckland, “Address Delivered on the Anniversary, February 19th,” *Proceedings of the Geological Society of London* 3, no. 81 (1841): 494–95; Roderick I. Murchison, “Annual Report of the Director-General of the Geological Survey, the Museum of Practical Geology, the Royal School of Mines, and the Mining Record Office, for the Year 1867,” *Fifteenth Report of the Science and Art Department of the Committee of Council on Education* (London: George E. Eyre and William Spottiswoode, 1868),



black gold from most corners of the earth were collected and their power to fuel steam engines—first of all on the seas—carefully analyzed. The chief executive of this project of global appropriation was Richard Murchison, a geologist whose reputation rested on the exploration of Silurian fossils, so valuable because they facilitated the identification of coal-holding strata, his main task as president of the Royal Geological Society, director general of the Geological Survey, director of the Royal School of Mines, and likewise the Museum of Practical Geology: the magnetic man toward whom the coal seams of the world seemed to flow. “Steam,” he spelled out his doctrine, “is the acknowledged new element of advancement, by which this age is distinguished from all which have preceded it. By its magic power distance is set at naught; and the productions of the antipodes are brought rapidly together. *Coal*, therefore, must henceforth be the motor and the meter of all commercial nations. Without it no modern people can become great, either in manufactures or in the naval art of war.”<sup>54</sup>

The British had turned coal, index of their power, ethos of the fossil economy, into “the motor and the meter of all commercial nations”: it had not been thought of that way before.<sup>55</sup> Until the century of Pax Britannica, coal had never fueled a perpetual increase in wealth. The British encountered savages who—index of their barbarism—ignored the material, burned it on occasion without any discernible enthusiasm, or simply played with it—but such juvenile activities could be used as clues to the locations of future mines. “As coal is often converted into ornaments and toys by uncivilized tribes unacquainted with its more important uses,” an 1838 report to the East India Company emphasized, “some traces of it in such shapes might generally be detected by observant travellers”: all eyes should stay open and officers be on the alert in Assam, Madagascar, Arabia, and any other part of the world now open for penetration.<sup>56</sup> Thus the British Empire went about subjugating the world to the logic of the fossil economy—a novel structure, utterly absent from all but a tiny corner of the canvas of history, making its way over the surface of the earth during the nineteenth century.

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269; Stafford, *Scientist*, 82, 92, 100–103, 114, 132–43, 145–46, 159–61, and “Geological Surveys, Mineral Discoveries, and British Expansion, 1835–71,” *Journal of Imperial and Commonwealth History* 12, no. 3 (1984): 5–32.

54. Roderick Murchison, “Tours in the Russian Provinces,” *Quarterly Review* 67 (1840–41): 373; in the original, the words “naval art of war” are also emphasized. For all things Murchison, see the superb biography by Stafford, *Scientist*.

55. The same change in perception in nineteenth-century China is brilliantly captured in Shellen Xiao Wu, *Empires of Coal: Fueling China’s Entry into the Modern World Order, 1860–1920* (Stanford, CA: Stanford University Press, 2015).

56. “Reports of a Committee for Investigating the Coal and Mineral Resources of India,” 196.

As a by-product, sources of carbon dioxide proliferated. Engineer Fryar came close to realizing this in his *Letter to the Proprietors and Managers* in his own peculiar way. Not only were the temperatures unbearably high in the Indian mines, particularly when sahibs came down for inspection, but “ventilation is so entirely disregarded” that “the atmosphere becomes vitiated and unfit for respiration, and as a consequence, the energies of the workmen are diminished.” Most injurious was the gas then known as “carbonic acid,” or CO<sub>2</sub>. In fresh air, Fryar remarked, it leaves only a trifling trace, the bulk consisting of nitrogen and oxygen, but inside the unventilated mines it accumulated without bounds and acted as a “virulent poison.” The engineer proposed a general rule: “Whatever tends to destroy these relative proportions of the gases”—in the normal, healthy atmosphere—“should be coped with as an enemy to human vitality and animal energy.”<sup>57</sup> Needless to say, that pertained only to effective management of labor in the collieries. Premature death from CO<sub>2</sub> poisoning was a fate still reserved for the workers underground. As for any other, wider consequence, it would long remain off the radar.

#### ANTHROPOCENE OR HISTORY

Originating from within the hard natural sciences, “the Anthropocene” is now the master concept guiding most research into climate change in the social sciences and humanities. Rarely has a neologism swept the two cultures alike with such rapidity. The general idea should be familiar by now: due to a list of environmental transformations topped by climate change, humans have overrun the natural relations that make up the earth system and, inadvertently, seized control of their further development. The prematurely terminated Holocene has been succeeded by the epoch of our species, at the hands of which some key indicators of the state of the biosphere—CO<sub>2</sub> concentration and temperature, above all—have drifted far beyond the range of their natural, presocial, in a sense prehistorical variability. Clearly, the concept of the Anthropocene is germane to historical studies of the fossil economy. Yet it has its problems. They could be divided into two classes: one related to the *anthropos*, the other to the *cene*.

When Paul Crutzen first introduced “the Anthropocene,” he dated the new geological epoch to James Watt’s invention of the rotary steam engine.<sup>58</sup> During the early career of the concept, that genealogy scored high approval rates, and for good reasons: by impelling machines and vehicles, the steam engine linked coal to the two fulcrums of self-sustaining growth—machines for producing and

57. Fryar, *Coal Mining in India*, 17–18.

58. P. J. Crutzen, “Geology of Mankind,” *Nature* 415, no. 6867 (2002): 23.

vehicles for transporting commodities—and thereby inaugurated a new era in the relation between humans and the carbon cycle.<sup>59</sup> So far so good. The problem arises when this history is derived from the *anthropos*, or the species as such. One popular version of the narrative draws a straight line from the ability to manipulate fire, acquired by hominins some half a million years ago, to the burning of coal, oil, and natural gas in the wake of the Industrial Revolution.

“The mastery of fire by our ancestors provided humankind with a powerful monopolistic tool unavailable to other species, *that put us firmly on the long path towards the Anthropocene*,” the main standard-bearers of the concept write.<sup>60</sup> In *Children of the Sun: A History of Humanity’s Unappeasable Appetite for Energy*, Alfred W. Crosby outlines the same evolutionary sequence, starting with the “imperial power” of controlled fire, moving on a linear track from the cooking stove to the steam engine and further on to the automobile and the electrical cable—all manifestations of the same eternal human desire for “more of *more*”—reaching the summit in the Anthropocene, in which “we are at least as powerful as ancient Nordic gods.”<sup>61</sup> In the view of Nigel Clark and Kathryn Yusoff, “learning to handle fire is the single most important moment in becoming human,” a feat that eventually led the species to build “‘fire engines’ that were robust enough to contain and channel the highly concentrated energy of fossilized biomass”: steam engines, that is.<sup>62</sup> A recent archaeological case study from northern Tanzania restates the thesis that early fire-using humans were “precursors of the actions that would change the earth in times-to-come”: first wood on the cave hearth, then coal under the factory boiler.<sup>63</sup> A decade and a half into the epoch of the Anthropocene concept, the narrative has not lost its traction.

It is teleological.<sup>64</sup> Prefossil economies have no thick reality of their own, no structure resistant to change; they do not need to be ruptured or overthrown,

59. See further, Malm, *Fossil Capital*.

60. Will Steffen, Paul J. Crutzen, and John R. McNeill, “The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?,” *Ambio* 36, no. 8 (2007): 614; emphasis added. For more examples of this fire narrative, see Malm, *Fossil Capital*, 30–32, 405–6.

61. Alfred W. Crosby, *Children of the Sun: A History of Humanity’s Unappeasable Appetite for Energy* (New York: W. W. Norton, 2006), 8, 102, 159.

62. Nigel Clark and Kathryn Yusoff, “Combustion and Society: A Fire-Centred History of Energy Use,” *Theory, Culture, and Society* 31, no. 5 (2014): 208, 221.

63. Rosa M. Albert, “Anthropocene and Early Human Behavior,” *The Holocene* (2015), 8, <http://hol.sagepub.com/content/early/2015/05/27/0959683615588377>.

64. For a short essay that reflects on the historical role of fire without succumbing to the temptation of teleology, focusing instead on the radical “diversity of fire regimes that have existed on Earth,” see David M. J. S. Bowman, “What Is the Relevance of Pyrogeography to the Anthropocene?,” *Anthropocene Review* 2, no. 1 (2015): 75.

just passed through along the route to conflagration on a biospheric scale. But “rather than assuming that the world of the past must have been governed by the same logics as the world of the present,” writes William Sewell, “historians assume that the social logics governing past social worlds *varied fundamentally*”; the shift from one order to another was rarely smooth or predetermined, but more often lumpy, contingent, even traumatic.<sup>65</sup> The fire story seems to contradict perhaps the most elemental insight of historians: things were not always like this.<sup>66</sup> To become as they are today, massive dislocation had to supervene.

As the British learned when they set foot in Assam, on Borneo, in Natal, in Turkey, far from all humans who knew how to light and slake a fire developed a fossil economy, even if they had immediate access to coal and knew it could be used for fuel. Rather than being precursors, most of them evinced utter indifference to the fossil riches and adhered faithfully to the customs of their forebears. The fossil economy had to be foisted on them. Mastery of fire is compatible with a whole range of economies (including postfossil ones) and so cannot be the source of origin or sustenance for that peculiar type: it is a trivial condition, alongside bipedal locomotion, excavation tools, written alphabets, and quite a few more. Hominin conquest of fire is an event too remote from the nineteenth-century construction to have anything much to do with it; invoking it is, to quote John Lewis Gaddis, “like explaining the success of the Japanese fighter pilots in terms of the fact that prehumans evolved binocular vision and opposable thumbs. We expect the causes we cite to connect rather more directly to consequences” or else we disregard them.<sup>67</sup> Fighter pilots make for an apt analogue: the British bearers of the fossil economy descended on other continents as though from the sky.

The problem, however, is not one of fire only. It is about the species as a historical actor. It tends to take center stage in the Anthropocene narrative. In one single landmark publication, Christophe Bonneuil counted 103 uses of “man-

65. William H. Sewell Jr., *Logics of History: Social Theory and Social Transformation* (Chicago: Chicago University Press, 2005), 10; emphasis added. And indeed, historiographers of the most varied temperaments subscribe to this weltanschauung. “Discontinuity is perhaps the single most important issue that historians deal with,” confirms Eelco Runia, while developing his vitalist-voluntarist philosophy of history, in which historical acts are sublime deeds, mysteries of human creativity, leaps in the dark without grounds or causes. Eelco Runia, *Moved by the Past: Discontinuity and Historical Mutation* (New York: Columbia University Press, 2014), xii.

66. Compare Guldi and Armitage, *The History Manifesto*, 14, 35–37.

67. John Lewis Gaddis, *The Landscape of History: How Historians Map the Past* (Oxford: Oxford University Press, 2002), 96; cf. Marc Bloch, *The Historian’s Craft* (1954; repr., Manchester: Manchester University Press, 1992), 158–59.

kind," "humankind," "humans," "humanity," "our species," "the human enterprise," and similar variations. That choice of protagonist has serious historiographical consequences: "A biological category, the 'species' or the 'population', rather than specific social groups bearing situated cultural values and taking particular socio-economic and technical decisions, is elevated to a causal explanatory category in the understanding of human history."<sup>68</sup> Needless to say, Bonneuil and others who have—at long last—submitted the narrative to critique do not demur at the characterization of climate change and other ecological maladies as anthropogenic. It is the slide from that incontestable discovery to the species as a single unitary actor that worries them.<sup>69</sup>

In the records of the fossil economy, traces of such an actor are yet to be found. Steam power, to begin with, was not developed and diffused across the earth by *Homo sapiens sapiens* but by the British ruling class (soon followed by the French and American and some other Western ones). Those taxonomic ranks should not be mixed up. Owners of means of production and transportation from one insular kingdom put the world firmly on the path it still travels: they did not come as the long-awaited emissaries of an evolutionary inheritance. They came in the pursuit of their own material interests, on an enterprise neither more nor less quintessentially human than the ways of life upheld by the tribes of the Khasi Hills or the natives of Labuan. That would, at least, be the historical analysis—the one informed by the sensibilities of this particular discipline—although prejudice, social Darwinism, or taxonomic confusion could possibly generate another conclusion.

Sticking to empirically observable history, it seems that large-scale combustion of fossil fuels could not have been initiated on the species level, since it presupposed that some people commanded the labor of others: the lesson learned by the British ruling class throughout its Empire. Indeed, fossil fuels are by their very definition a condensation of unequal social relations, for no humans have yet engaged in systematic extraction of them to satisfy subsistence needs. An insufficient but necessary and nontrivial condition of the fossil economy, waged or forced labor, was—unlike mastery of fire—not present always and everywhere; not even the British Empire could guarantee it, as the fate of the Labuan

68. Christophe Bonneuil, "The Geological Turn: Narratives of the Anthropocene," in *The Anthropocene and the Global Environmental Crisis: Rethinking Modernity in a New Epoch*, ed. Clive Hamilton, Francois Gemenne, and Christophe Bonneuil (Abingdon: Routledge, 2015), 19.

69. See further, e.g., Andreas Malm and Alf Hornborg, "The Geology of Mankind? A Critique of the Anthropocene Narrative," *Anthropocene Review* 1, no. 1 (2014): 62–69; Jeremy Baskin, "Paradigm Dressed as Epoch: The Ideology of the Anthropocene," *Environmental Values* 24, no. 1 (2015): 9–29.

mines shows. Yet it was only one of several inequalities that constituted the fossil economy. Concocted in a constricted core, steam power was explicitly conceived as a weapon to augment the power over the peripheries, haul in the products of all continents, dispatch manufactured goods in return, and ensure military superiority all along the way, in a sort of fossil-imperial metabolism that undergirded the post-1825 development of empire.

The history of how rich white men from Britain (and then its rival empires) pointed steam as a weapon against the best part of humankind—from the Niger to the Yangzi, the Levant to Latin America—has still only been scratched on the surface, including in India.<sup>70</sup> Indeed, the claims just made need extensive primary research for confirmation, full demonstration, or, naturally, invalidation: such is the imbalance between Benjamin's trays. But the appearance of *anthropos* as such would be utterly miraculous. Insofar as "the Anthropocene" is tied to the species level, students of the history of the fossil economy would be well advised to keep a distance to it—but one should not, of course, rule out the possibility that a properly historical narrative could be combined with that formal geological designation, if freed from its quasi-biological connotations.

The second problem pertains to the discipline of geology. Crutzen's original steam chronology has taken a beating of late, since it does not live up to the key demand of geologists: an unambiguous, abrupt, globally synchronous marker in the stratigraphic record, also known as a "golden spike." One unit of geological time can be separated from another, for instance, by a species that pops up at the same point in rocks or sediments across the world. When it comes to the Anthropocene, no one is searching for remnants of a new species, but then there must be some other stratigraphic signal to satisfy the geologists, who are, after all, the ones to adjudicate on the nomenclature. The "cene" in Anthropocene comes from the Greek *kainos* for "new" or "entirely recent," the same suffix as in Holocene, Pleistocene, Pliocene, and further back in time, and if the term has any *raison d'être*, it must be to match those epochs as a scientifically secured unit.

70. The seminal contributions are Daniel R. Headrick, *Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (Oxford: Oxford University Press, 1981), and *Power over Peoples: Technology, Environments, and Western Imperialism, 1400 to the Present* (Princeton, NJ: Princeton University Press, 2010), chap. 5. But research in this area now finally seems to be picking up pace. An important corrective to some aspects of Headrick's analysis is Dewey, *Steamboats on the Indus*. Other notable recent contributions are Sinha, *Communication and Colonialism*; and Wu, *Empires of Coal*. As for nineteenth-century India, Sinha notes that "the manifold histories of steamships in this period—economic, cultural, and scientific—is still a subject that awaits in-depth research"; furthermore, "the introduction of steamships and railways led to a considerable increase in the production of coal, a subject which awaits further historical exploration," in *Communication and Colonialism*, 180, 26.

Now the problem is that the signal of the Anthropocene is not all that unambiguous. The steam engine did not cause a clearly visible spike in atmospheric CO<sub>2</sub> concentration—it took decades if not a century for its power to play out—and hence geologists and their colleagues have tended to abandon James Watt in favor of some other candidate, opening a Pandora’s box of possible chronologies. Two have attracted support recently. In an article in *Nature*, Simon L. Lewis and Mark A. Maslin propose 1610 as the year when the Anthropocene began, because a sudden drop in CO<sub>2</sub> concentration can be observed in ice cores from that time. This they explain as a consequence of the post-Columbian depopulation of the Americas, which presumably caused afforestation large enough to sequester carbon dioxide equivalent to a few parts per million.<sup>71</sup> Critics have immediately objected that the dip was fully within the natural Holocene variability—hence no reason to attach a new epoch to it—and probably caused by nonhuman factors; that nothing in the earth system fundamentally changed because of it; that nothing of world-historical significance happened in 1610—but surely the weirdest thing about the proposal is that it hinges on a fall in CO<sub>2</sub> concentration, the very opposite of what sets our epoch apart.<sup>72</sup> Indeed, 1610 lies close to the onset of the Little Ice Age.

At the other end of the spectrum lies the suggestion that the Anthropocene began at 11:29:21 Greenwich Mean Time on July 16, 1945, when the Trinity A-bomb detonated at Alamogordo, New Mexico—the first nuclear bomb in geological history, having a certain family resemblance with the asteroid that killed the dinosaurs at the Cretaceous-Paleogene boundary, producing an easily detectable spike in artificial radionuclides worldwide.<sup>73</sup> This has also met with objections. Here CO<sub>2</sub> has disappeared entirely.<sup>74</sup> Nuclear bombs might be the most horrific of human inventions, but their testing did, again, nothing to change the earth system and had no relation to the phenomenon of global warming.<sup>75</sup> A

71. Simon L. Lewis and Mark A. Maslin, “Defining the Anthropocene,” *Nature* 519 (2015): 171–80, and their “Geological Evidence for the Anthropocene,” *Science* 349, no. 6245 (2015): 246.

72. Jan Zalasiewicz, “Disputed Start Dates for Anthropocene,” *Nature* 520 (2015): 436; Clive Hamilton, “Getting the Anthropocene So Wrong,” *Anthropocene Review* 2, no. 2 (2015): 102–7.

73. Jan Zalasiewicz, Colin N. Waters, Mark Williams, et al., “When Did the Anthropocene Begin? A Mid-Twentieth Century Boundary Level Is Stratigraphically Optimal,” *Quaternary International* 383 (2015): 196–203.

74. William F. Ruddiman, Erle C. Ellis, Jed O. Kaplan, and Dorian Q. Fuller, “Defining the Epoch We Live In,” *Science* 348, no. 6230 (2015): 38–39.

75. Clive Hamilton supports the proposal, although it is equally guilty of several of the errors he chides Lewis and Maslin for. See Clive Hamilton, “Getting the Anthropocene So Wrong.”



focus on mid-twentieth-century developments still has a lot to recommend it, though; after 1945, there was a “Great Acceleration” in human influence on the biosphere—the rise in CO<sub>2</sub>, as well as methane emissions, ozone levels, nitrogen transfer, and a host of other indicators captured in a well-known series of stunning graphs—which has yet to slow down. In a recent article, the bulk of that influence has been accredited to the segment of humanity residing in the OECD (class accounting would narrow it further).<sup>76</sup> That certainly marks a step in the right direction for the Anthropocene narrative, away from species thinking and toward a more fine-grained historical analysis—and it also marks, although its proponents would be loath to admit it, a more tenuous link to the quest for the golden spike, since the Alamogordo test is only tangential to the Great Acceleration (and completely irrelevant to climate change).

On the other hand, with a focus on post-World War II developments, the most compelling aspect of Paul Crutzen’s original dating is lost—namely, the connection to the birth of the fossil economy. With the fragmentation of the Anthropocene discourse, that event—which kindled a secular rise in CO<sub>2</sub> concentrations, slow and gradual at first, then steep and accelerating—seems to have fallen out of sight. So has the fossil economy as such, replaced by anything from afforestation to nuclear radiation. It appears, then, that “the Anthropocene” can be useful for the study of the history of the fossil economy insofar as it cuts the moorings to (1) the *anthropos*, the species, and (2) the *kainos*, the spike. Then researchers would be free to pursue the concrete dynamics of this human, all too human, history. The question, of course, is what would then remain of the Anthropocene.

#### FOSSIL CAPITAL, FOSSIL STALINISM

In the age of the fossil economy, labor has been subsumed under capital. The ascent of steam in Britain occurred in the context of capitalist domination of labor, beamed with the military power of that nation onto such distant places as the Khasi Hills and Labuan. Since then, the prime mover of the fossil economy appears to have been what we might call “fossil capital,” most simply defined as the production of exchange value and the maximization of profit by means of fossil energy as a necessary material substratum. Rex Tillerson, president and CEO of ExxonMobil, whose fortunes from this line of business are some of the largest in history, has summed up the spirit of fossil capital with exemplary

76. Will Steffen, Wendy Broadgate, Lisa Deutsch, et al., “The Trajectory of the Anthropocene: The Great Acceleration,” *Anthropocene Review* 2, no. 1 (2015): 81–98.



clarity: “My philosophy is to make money. If I can drill and make money, than that’s what I want to do.”<sup>77</sup> Ever since the age of steam, this credo has informed the actions of capitalists of all hues: if I can dig up fossil fuels or burn them and make money, then that’s what I want to do, and *après moi, le deluge*.

But here an objection is shouted out loud.<sup>78</sup> What about the Soviet Union and its satellites? Were they not just as dirty as Britain or the United States or West Germany or any other capitalist country, if not measurably more so? Why, then, singling out capital for special censure, rather than the human—or industrial, or developmental, or some other universal—enterprise as such? Indeed, under our general definition, the Stalinist states would have likewise fulfilled the criteria of a fossil economy: they grew by dint of consuming fossil fuels. In *An Environmental History of Russia*, currently the authoritative work on the topic, Paul Josephson and his five Russian colleagues notice that at one point in the 1970s, the Soviet Union was the global leader in coal production and outstripped its great Cold War rival in annual output of oil; gas added its share to make the socialist fatherland saturated in fossil energy.<sup>79</sup> It was Stalin’s rise to power that issued in the guzzling. The chronicle of Josephson and colleagues reconfirms—although they never make a point of it—the sharp break in environmental policy between early Bolshevik rule, with its tantalizing forays into nature conservation and resource husbandry, and the first five-year plan, among whose aggressive targets one can find a doubling of coal production.<sup>80</sup> As it happened, the extraction of fossil fuels in the Soviet Union long relied on forced labor. One of its centers was Vorkuta, where workers seized and delivered to the Gulag regime were commanded to exploit recently discovered coalfields: essentially a slave city that soon “grew rapidly without consideration of

77. *Business Week*, “Charlie Rose Talks to ExxonMobil’s Rex Tillerson,” March 7, 2013. See further Steve Coll, *Private Empire: ExxonMobil and American Power* (London: Penguin, 2012).

78. For some random but typical examples, see Adam Trexler, “Integrating Agency with Climate Critique,” *symploke* 21, nos. 1–2 (2013): 225, and *Anthropocene Fictions: The Novel in a Time of Climate Change* (Charlottesville: University of Virginia Press, 2015), 191; Michael McCarthy, *The Moth Snowstorm: Nature and Joy* (London: John Murray, 2015), 240.

79. Paul Josephson, Nicolai Dronin, Ruben Mnatsakanian, et al., *An Environmental History of Russia* (Cambridge: Cambridge University Press, 2013), 186, 130.

80. *Ibid.*, 60–133. See further Douglas R. Weiner, *Models of Nature: Ecology, Conservation and Cultural Revolution in Soviet Russia* (Pittsburgh: University of Pittsburgh Press, 2000); Arran Gare, “Soviet Environmentalism: The Path Not Taken,” in *The Greening of Marxism*, ed. Ted Benton (New York: Guilford, 1996), 111–28. These forays are certainly not to be taken for evidence of a marvelously green consciousness of the revolutionary leadership: Leon Trotsky, for one, took Marxist Prometheanism to some of the craziest heights ever seen. See Paul R. Josephson, *Would Trotsky Wear a Bluetooth? Technological Utopianism under Socialism, 1917–1989* (Baltimore: Johns Hopkins University Press, 2010), which also includes important case studies of environmental destruction in other Stalinist states.

pollution issues because of its contributions to defense industries.”<sup>81</sup> By such means, coal fed the Soviet model of growth.

That catastrophic legacy should be studied on its own terms. Laconic in its comments on the topic, standing on the shoulders of a limited literature, *An Environmental History of Russia* makes it clear that the Stalinist edition of the fossil economy is as much in need of empirical research as any other—on exactly how fossil fuels were linked to the growth machine; on the labor regimes, the distribution of benefits, the policy changes and continuities between 1917 and 1989, and much else. Perhaps more important, it indicates the need for basic conceptual work to grasp the mechanisms of growth and the dependence on fossil fuels in Stalinist formations. Josephson and colleagues hardly even reflect on that question—their method is strictly empiricist—but if read alongside *Western Marxism and the Soviet Union: A Survey of Critical Theories and Debates since 1917*, a subagenda emerges. In that masterly study, Marcel van der Linden demonstrates that all theories of Stalinist formations—as “degenerated workers’ states,” “state capitalism,” “bureaucratic collectivism,” or some other freakish mode of production—have failed in one crucial respect or another, leaving post-1989 generations with no workable analytical framework for comprehending that inescapable legacy.<sup>82</sup>

Now that we can also begin to discern what Stalinism did to the climate (and to the very idea of an alternative ecological order), there is reason to return to the question of whether it copied the more advanced West or operated in a qualitatively different manner, or did both to varying degrees, and if any of the above, how this played out in nature. On the face of it, something like the Vorkuta coal-mining gulag seems to have followed laws of motion rather foreign to capitalism (absolute state command over labor, a party leadership obsessed with gross output, the security of Kreml the one overriding concern, et cetera). As a placeholder, awaiting the empirical and conceptual work, we could put “fossil Stalinism” as a term for this type of fossil economy, most simply defined as the maximization of the power of the bureaucracy by means of fossil fuels.

It is no reason to place fossil capital any lower on the agenda. There is something strange with the speed with which the Soviet Union is thrown against anyone who wants to study specifically capitalist dynamics of climate destabiliza-

81. Josephson et al., *An Environmental History*, 75.

82. Marcel van der Linden, *Western Marxism and the Soviet Union: A Survey of Critical Theories and Debates since 1917* (Chicago: Haymarket, 2009).

tion. Few would probably question the legitimacy of exploring how capitalism generates inequality and poverty by pointing to the Soviet Union—likewise plagued by the ills—but when it comes to the environment, we are quickly told that really existing socialism performed no better. Then we should remember that inequality and poverty were not invented by capitalism (two thousand years ago, Jesus testified to their supposed eternity), whereas the fossil economy is the singular offspring of a distinctly capitalist economy, on whose wings it spread to other parts of the globe. Chronologically, causally, historically, the link between the fossil economy and capitalism appears far more intimate.

And Stalinism is dead. Fossil capital, on the other hand, is very much alive, burrowing its way through the crust, surface, and atmosphere of the earth, on the same trajectory it has followed since the early nineteenth century—this is the truly haunting legacy, because it is so dreadfully far from finished. Most likely, Stalinist formations are responsible for a fraction of cumulative CO<sub>2</sub> emissions; most certainly, it shrinks by the day. The parenthesis around Vorkuta is closed, while Raniganj has been universalized. Business-as-usual is maintained not by any abstract forces of industry or humanity but by Rex Tillerson and his gang: since the early 1990s, when climate science crystallized—coincidentally around the time the Soviet Union collapsed—the resistance against the shift away from fossil fuels has emanated from capital. It continues in innumerable shapes and forms, as climate denialism, fresh pipelines, drilling for extreme oil, fossil fuel subsidies, carbon trading, the massive relocation of industrial production to China, the refusal to engage in large-scale investment in renewable energy, the frantic booms in coal extraction from Germany to Vietnam, and the list goes on. Behind each of these acts of obstruction, fossil capital lurks. A critical history of the fossil economy should zoom in on the lines that led to this present.

In three cuts, we can thus narrow down the research agenda from the human species as a whole: first, to the level of the fossil economy; second, to the category of fossil capital; third—insofar as the search is for origins—to the agents who actually created both and extended them across the surface of the globe, and this is a group of people fairly easily delimited within, and below, the rank of *Homo sapiens sapiens*. Of this agenda, the logics and representatives of capital will be at the top. It goes against the current of Anthropocene thinking and seems more likely to align itself with that alternative, iconoclastic, cheeky, and mostly shunned label for our epoch: the Capitalocene.

Signs are, however, that a focus on capital is edging closer to scientific respectability. In late 2015, *Environmental Research Letters*, one of the leading journals of

hard climate science, published an article titled “Can the Capitalist Economic System Deliver Economic Justice?,” coming down on the side of no. Noticing the standard Soviet argument, reporting from hundreds of interviews with informants in seven countries, author Karen Bell concluded that “to achieve environmental justice, then, it appears necessary to at least minimise the negative impacts of capitalism but perhaps even to begin to dismantle the capitalist system altogether.”<sup>83</sup> One wonders if the IPCC will pick up on that conclusion in its next assessment report. Be that as is at may, it would be a shame if historians, of all people, would stick to a universal, more or less essentialist category—such as “the human enterprise”—rather than the concrete, contingent, combined and very uneven dynamic that leaps off the pages in the archives of the fossil economy.

### HISTORY ON FIRE

Among the philosophical resources for a more critical history, those formulated by Walter Benjamin and his peers stand out. If climate history seeks to generate knowledge of how societies might react and adapt to climate change, this enterprise has a different purpose: “The contemporary who learns from books of history to recognize how long his present misery has been in preparation (and this is what the historian must inwardly aim to show him) acquires thereby a high opinion of his own powers. A history that provides this kind of instruction does not cause him sorrow, *but arms him*.”<sup>84</sup> A history of the fossil economy should be militant—or, to put it in mainstream terms, oriented toward rapid mitigation—and take aim at fossil capital: “And this enemy has never ceased to be victorious.” The memory of its past ravages should be appropriated “as it flashes up in a moment of danger.”<sup>85</sup> The militancy for which the world is now crying out should draw on the traditions of those vanquished by the “progress” of fossil capital, all the anonymous losers who, to speak with Theodor Adorno, fell by the wayside from England to the Empire and further on to the energy frontiers of today.<sup>86</sup> Materialists, urge Benjamin, “cannot look on history as anything other than a constellation of dangers”; they should strive to explode

83. Karen Bell, “Can the Capitalist Economic System Deliver Environmental Justice?,” *Environmental Research Letters* 10 (2015): 7.

84. Benjamin, *Arcades*, 481; emphasis added.

85. Benjamin’s eleventh thesis on history, as included in the masterpiece of Michael Löwy, *Fire Alarm: Reading Walter Benjamin’s “On the Concept of History”* (London: Verso, 2005), 42.

86. Theodor Adorno, *Minima Moralia* (London: Verso, 2005), 161.

“the homogeneity of the epoch, interspersing it with ruins—that is, with the present,” a present of 400+ ppm, in which we must “accept symptoms of collapse as the quintessence of stability and see salvation alone as something so extraordinary as to pass understanding and verge on the miraculous.”<sup>87</sup>

If the historian of the fossil economy needs a vision to draw the past into her net, this one seems a most appropriate choice, for it is supremely prophetic—here we are, with Adorno, facing a horror “unforeseen, exceeding all expectations, the faithful shadow of developing productive forces.”<sup>88</sup> Or consider his notion of panic in the light of the current moment, charged with all the heat of the past: “The noontide panic fear in which men suddenly become aware of nature as totality has found its like in the panic which nowadays is ready to break out at every moment: men expect that the world, which is without any issue, will be set on fire by a totality which they themselves are and over which they have no control.”<sup>89</sup> Benjamin and Adorno seem to have chosen their words for this very moment. But the full application of their flashes of foresight to the past and present of the fossil economy awaits a collective research effort commensurate to that long underway in climate science.

#### A GIFT OF THE RAJ

Between 2000 and 2009, the CO<sub>2</sub> emissions of India grew by an annual average of 5.7 percent; during the next four years, the figure rose to 6.4 percent.<sup>90</sup> Coal, of course, fueled the process: the primary source of energy in India, the country is now the third-largest consumer in the world, its output having more than doubled since the turn of the millennium.<sup>91</sup> Referring to coal as “an essential input for power,” the minister responsible for the sector vowed in late 2014 to double production again over the next five years.<sup>92</sup>

In this accelerated dash for coal, India is, needless to say, anything but alone: over the past decade, more new coal-fired power plants were bestowed upon the

87. Benjamin, *Arcades*, 470, 474, and *One-Way Street and Other Writings* (London: Penguin, 2009), 57.

88. Adorno, *Minima*, 249.

89. Theodor Adorno and Max Horkheimer, *The Dialectic of Enlightenment* (London: Verso, 1997), 29. “Panic breaks once again, after millennia of enlightenment, over a humanity whose control of nature as control of men far exceeds in horror anything men ever had to fear from nature” (Adorno, *Minima*, 254).

90. P. Friedlingstein, R. M. Andrew, J. Rogelj, et al., “Persistent Growth of CO<sub>2</sub> Emissions and Implications for Reaching Climate Targets,” *Nature Geoscience* 7 (2014): 711.

91. US Energy Information Administration, “Country Report: India,” June 26, 2014, [www.eia.gov](http://www.eia.gov).

92. The *Economic Times*, “Coal Production to Double to 1 Billion Tonnes by 2019: Piyush Goyal,” November 6, 2014.

world economy than in any previous decade; in 2013, more energy entered it from coal than from any other source—more than from sun, from wind, from even the touted gas and oil renaissances.<sup>93</sup> But the magnitude and, above all, the timing of the Indian boom led some to accord it special significance. In November 2014, the *New York Times* ran a story on how the “coal rush in India could tip balance on climate change,” quoting prominent climate scientist Veerabhadran Ramanathan: “If India goes deeper and deeper into coal, we’re all doomed.”<sup>94</sup> Meanwhile, on Borneo, sensitive rainforest areas were torn apart, residents bought off their land, rivers contaminated, and emissions sent soaring by the boom of Indonesia, now the world’s largest coal exporter.<sup>95</sup> Yet all of this was, of course, overshadowed by the explosion in China.

Of world historical importance, some of the largest chimneys of the fossil economy are now found in Asia. How should this be interpreted? In two recent essays, Dipesh Chakrabarty—a historian, and of India to boot—has questioned the utility of historical materialism for understanding climate change and come down squarely on the side of the Anthropocene narrative: “The poor participate in that shared history of human evolution just as much as the rich do.”<sup>96</sup> A major argument for this view is the fires of China and India, which, Chakrabarty claims, are fueled by population growth and the eradication of poverty: “Chinese and Indian governments continue to build coal-fired power stations, justifying the move by referring to the number of people who urgently need to be pulled out of poverty; coal still remains the cheapest option for fulfilling this purpose. . . . The lurch into the Anthropocene has also been globally the story of some long anticipated social justice, at least in the sphere of consumption. *This justice among humans, however, comes at a price.*”<sup>97</sup>

93. Steven J. Davis and Robert H. Socolow, “Commitment Accounting of CO<sub>2</sub> Emissions,” *Environmental Research Papers* 9, no. 8 (2014): 1; Sonja van Ressen, “Coal Resists Pressure,” *Nature Climate Change* 5 (2015): 96–97.

94. Gardiner Harris, “Coal Rush in India Could Tip Balance on Climate Change,” *New York Times*, November 17, 2014.

95. John Vidal, “Swallowed by Coal: UK Profits from Indonesia’s Destructive Mining Industry,” *The Guardian*, October 30, 2013; Jake Maxwell Watts, “Coal Is Down 14 Percent This Year—but after a Brutal 2013, Some Mining Shares Are Up,” *Wall Street Journal*, May 22, 2014; Jenny Denton, “A Hunger for Coal Threatens the Heart of Borneo,” *Jakarta Post*, May 20, 2014.

96. Dipesh Chakrabarty, “Climate and Capital: On Conjoined Histories,” *Critical Inquiry* 41, no. 1 (2014): 14, and see further, “The Climate of History: Four Theses,” *Critical Inquiry* 35, no. 2 (2009): 197–222.

97. Chakrabarty, “Climate and Capital,” 12, 15–16; emphasis added. This is not the only argument Chakrabarty puts forth against a focus on capitalism and intrahuman inequalities. For a retort to some of the others, see Malm, *Fossil Capital*, 390–91.

Justice among humans? Far more thoroughly researched than its Indian counterpart, the Chinese emissions explosion has not—this is a matter of well-known data—been caused by population growth or the consumption of poor households or any other factor easily squeezed into the rank of species. It was ignited around the turn of the millennium by the relocation of manufacturing industry to China: and capital came for the cheap labor power.<sup>98</sup> As for India, the detailed mapping of the drivers remains to be done, but we already know that the doings of the poor have not provided the ignition mechanism, whatever governments might say and however they may justify their policies. Between 1981 and 2011, improvement in household electricity—the chief energy-related indicator of poverty alleviation—contributed 3–4 percent of the increase in Indian CO<sub>2</sub> emissions. Some 650 millions people connected to the grid made an impact on the atmosphere that can only be deemed trifling. Within the Indian population, the quintile of the poorest electrified households—a third of the nation is still off-grid—accounted for less than 10 percent of emissions growth from electricity consumption, whereas the richest quintile took around a half.<sup>99</sup>

As for equity on a global scale, it is nowhere in sight. One-tenth of the human species accounts for half of all present emissions from consumption; half of the species for one-tenth. Would we have to wait for an even more skewed distribution before we can abandon the unified species category and focus on relations between its polarized subsets? Raw data suggest a fracture that meets any reasonable criterion: the richest 1 percent have a carbon footprint some 175 times that of the poorest 10 percent; the emissions of the richest 1 percent of Americans, Luxembourgers, and Saudi Arabians are 2,000 times greater than those of the poorest Hondurans, Mozambicans, or Rwandans—and people like the latter are, of course, infinitely more vulnerable to the consequences of the very same emissions. Figures for India are no less striking. Even the richest 10 percent of the Indian population have per capita emissions that are just one-quarter of those of the poorest half of the American population, while the emissions of the poorest half of the Indian population do not exceed one-twentieth.<sup>100</sup> India is responsible

98. See Malm, *Fossil Capital*, 327–66, and “China as Chimney of the World: The Fossil Capital Hypothesis,” *Organization Environment* 25, no. 2 (2012): 146–77.

99. Shonali Pachauri, “Household Electricity a Trivial Contributor to CO<sub>2</sub> Emissions Growth in India,” *Nature Climate Change* 4 (2014): 1073–76.

100. Lucas Chancel and Thomas Piketty, “Carbon and Inequality: From Kyoto to Paris,” report, Paris School of Economics, November 3, 2015; Oxfam, “Extreme Carbon Inequality,” Oxfam Media Briefing, December 2, 2015.

for 3 percent of cumulative CO<sub>2</sub> emissions so far in history, and for around a third of the climate credit if counting only from 1990.<sup>101</sup> However measured and however defined, justice among humans is hardly the fuel of this fire.

A more fruitful line of critical inquiry, and one more attuned to the data, would be to investigate how the structure of the fossil economy has expanded from its original British soil to encompass most of the world, striking roots in the most varied social formations, bound up with the process of capital accumulation and the relations it requires, constituting the totality over which we have no control. Let us here take only one example: the Khasi Hills. In the 1840s, the British planted the first seed of the fossil economy in this remote frontier of the Empire. Originally unappreciative of the mineral, the Khasi tribes were subordinated to the Raj's apparatus of revenue extraction, and their village heads anointed tax collectors and partners in the commercial penetration of the Hills. A local ruling class gradually broke away from the hitherto egalitarian community. After independence, and particularly after Bangladeshi independence, this was the class—blending clan lineage, political patronage, and transnational partnerships—that seized the opportunities underground, appropriated common land, and invested in mines to feed the burgeoning cement plants in neighboring Bangladesh.<sup>102</sup> Anthropologist Debojyoti Das, one of the contributors to the essential anthology *The Coal Nation: Histories, Ecologies and Politics of Coal in India*, describes the landscape:

The capital produced from the export of coal to nearby Bangladesh and mainland India allows conspicuous consumption, and has led to the growth of real estate businesses in Shillong [capital of Meghalaya, the state to which the Khasi Hills now belong] and renting structures of capitalism among the indigenous community elites who own mines and maintain control over production processes. . . . My fieldwork revealed that the wage earners work under extreme risk and are provided with no social security benefits. The dwellings in immigrant settlements are suffocating: each hut houses a dozen people. In the cities, . . . mine owners live in modern houses with luxurious facilities and glitzy cars are parked in the apartments and bungalows. . . . Benefits accrue to powerful mer-

101. Pep Canadell and Michael Raupach, "Global Carbon Report: Emissions Will Hit New Heights in 2014," *ECOS Magazine*, September 29, 2014, [www.ecosmagazine.com](http://www.ecosmagazine.com); Matthews, "Quantifying Historical Carbon."

102. Debojyoti Das, "Border Mining: State Politics, Migrant Labour, and Land Relations along the India-Bangladesh Border," in Lahiri-Dutt, *Coal Nation*, 79–104.



chants and coal mine owners rather than to forest villagers and mine worker immigrant labourers who bear the ecological and social cost.<sup>103</sup>

If one is searching for justice among humans, the fossil economy of India might be one of the worst places to look.<sup>104</sup> Instead, as Kuntala Lahiri-Dutt, geographer and editor of *The Coal Nation*, emphasizes, “the kingdom of coal as we know it in India is primarily a gift of the Raj, a by-product of colonial rule,” extended and enlarged in the era of independence through the largely inherited power of some over others.<sup>105</sup> The Empire was indeed eminently successful in this regard. It managed to universalize the fossil economy, transplanting the wedlock between growth and fossil fuels to the lands it dominated; after withdrawal, the British could watch the emulations of their model rise toward the sky. The continuity, transmutation, diffusion, extrapolation of the union between capital accumulation and fossil fuel combustion—first invented by the British ruling class—roll over the *longue durée* of our changing climate.<sup>106</sup>

In early December 2015, just as the leaders of the world hammered out what became the Paris agreement on climate change, parts of south India suffered the heaviest downpours in a century. Some 400 people were killed and 2 million displaced by the deluge; overflowed by two major rivers, the city of Chennai stood under water. At that point, the Indian environment minister Prakash Javadekar, stepping right into the never-ending fray of UN climate negotiations, declared: “What is happening in Chennai is the result of what has happened for 150 years in the developed world. That is what has caused 0.8 degrees Celsius temperature rise. . . . Historically, for the last 150 years, they have reaped the benefits of growth and *now they can't say that past is past.*”<sup>107</sup> He was right, mostly. He should have added that what was happening in Chennai was also the result of

103. *Ibid.*, 85–86, 90–91.

104. For a survey of the social and ecological devastation of India following the turn to neoliberal policies in 1991 and the enormous injustices that have followed, see Aseem Shrivastava and Ashish Kothari, *Churning the Earth: The Making of Global India* (Gurgaon: Penguin, 2014).

105. Lahiri-Dutt, “Introduction to Coal in India,” 10.

106. This implies a rejection of the a priori anxiety over “diffusionism,” understood as a historical explanation that posits Europe as the source of change and the rest of the world as its recipient. See J. M. Blaut, *The Colonizer's Model of the World: Geographical Diffusionism and Eurocentric History* (New York: Guilford, 1993). In the case of the fossil economy, it was in fact one European country that created it and the rest of the world that received or emulated it. A more comprehensive critique of the errors of the purportedly anti-eurocentric anti-diffusionism of Blaut and other world-system theorists will be developed elsewhere.

107. Vikas Pathak, “Javdekar Blames Developed Nations for Chennai Deluge,” *The Hindu*, December 4, 2015; emphasis added.

what has happened over the past two centuries in the developing world, under the auspices of imperialist powers, and of what is now being done by the governments—including his own—that have assumed their sooty mantles. Likewise, he could have pointed out that the advanced capitalist states that single-handedly constructed the fossil economy in the service not of humankind, but of their own enrichment, thereby drove people into those margins of poverty and vulnerability into which the early blows of climate chaos now slam. What needs to be understood, as a matter of ongoing history, is how we ended up precisely here.