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Daggett, Cara New. 2019. *The Birth of Energy: fossil fuels, thermodynamics, and the politics of work*. Durham, NC and London: Duke University Press. Paper ISBN 978-1-4780-0632-9, \$26.95; Cloth ISBN 978-1-4780-051-8, \$99.95. x + 268 pp.

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Cara New Daggett's *The Birth of Energy* is a major contribution to the environmental humanities that speaks to the notion of "political ecology" in the most literal sense. The field of ecology emerged in the late nineteenth century to change the way the natural world was studied. Biologists had long been examining organisms as entities, but the new science displaced the living subject, focusing instead on the interactions between organisms and their environment. Behind this relational turn was an amalgamation of the biologists' attention to the organism and the physicists' fascination for what had become known as *energy*. Each individual organism represented an exchange of energy and matter with its surroundings, sustaining its metabolism in order for it to reproduce itself. Beneath the veneer of the individual were continuous energy flows, acting according to the principles of thermodynamics. Daggett delves into the work of a group of engineers in Victorian Glasgow to provide a genealogy of "energy." Her central argument is that the knowledge of energy, captured in the laws of thermodynamics, came to reflect a moral code that was rooted in the Protestant ethics of its inventors. Celebrating work and condemning idleness, the moral imbued in thermodynamics—and hence the field of ecology—served the interests of capital and empire. A progressive politics towards a low-carbon economy therefore requires us to challenge the worldview entrenched in the energy idea.

In the first part of the book, Daggett traces the history of energy in Victorian Britain where it crystallized in and around the increasingly ubiquitous steam engine. The steam engine, and the coal breathing life into it, replaced the need for human labor in production. Physicists like William Thomson (later ennobled as Lord Kelvin) came to describe its mechanical effects as the capacity to do "work." Thomson's idea was that the motion of the piston, doing work, and the heat generated from the combustion of coal were instances of the same omnipresent phenomenon—energy—a medium qualitatively transformed but quantitatively conserved. And yet, for the engineers seeking to increase the amount of work achieved per measure of coal, the irreversibility of these conversions was puzzling: coal could move pistons, but a moving piston could not make coal. Daggett argues that they made sense of this strange phenomenon in the context of their Scottish Presbyterian cosmology. Energy was a constant like God, but each time it was put to use, its usefulness diminished for the imperfect humans seeking to command it. Every energy conversion created power losses, heat dissipation, and waste—increasing entropy, in thermodynamic terms. The dualism of work and waste was mediated by the strive for higher productivity in the cotton mills. The more efficient the conversion of one energy form into another, the less work would go to waste. Increasing efficiency meant larger profits. Daggett shows how the Scottish engineers infused thermodynamics with the same Protestant ethic that Weber found at the heart of European capitalism. Salvation could only be reached through hard work and frugal life: "The two concerns—waste and the dissipation of energy into unusable forms—resonated not only with the capitalist drive for profit, but also with long-standing theological obsessions in Protestantism with sin and sloth" (p. 36).

Building on a closely argued intellectual history of energy, the second half of the book explores how the spread of thermodynamic knowledge globally did political work in the service of empire. Daggett focuses on the use of ecological metaphors—the organism and metabolism—by British imperialists in Africa to classify humans, organize labor, and legitimize empire, and how the Protestant ethic translated into raced models of labor governance through technical education in the United States. Echoing an Orientalist worldview, thermodynamic concepts pointed towards a racist analysis of human life. White Europeans had reached a higher level of civilization than other races in light of their superior work ethic. Africans and native Americans were the least productive, testifying not only to their primitive work practices but to their laziness, allowing precious work potential to go to waste. In this way, an "energetic racism" animated imperial practice, with thermodynamic principles reinforcing hierarchies of race, class, and gender, thus validating a European civilizing mission overseas. Here, fossil fuels provided the conditions of possibility for an important historical shift. As stores of concentrated energy potential, fossil fuels allowed politically and economically strong centers to replace coerced human labor with the power of "inorganic slaves" (p. 102). Coal and oil, doing work in one

place to expand industry and infrastructure, displaced the environmental burden of production globally, rendering the underbelly of work invisible to privileged populations. Similarly, Alf Hornborg has long insisted that Western populations are aware of modern technology's reliance on energy but tend not to acknowledge the social logic by which this energy is provided to them in ever increasing amounts; "the thermodynamics of imperialism" as he has referred to it (2001: 35).

Throughout, Daggett argues that the notion of "energy" embodies a Western epistemology and that the spread of thermodynamic knowledge sidelined other ways of knowing it. When Thomson and his contemporaries saw that the usefulness of energy diminished as soon as it was set to work, this was a question of utility *for humans*. Thermodynamics was in this sense inherently anthropocentric. In the scientific discourse of energy, countless cultural practices having little or nothing to do with each other (be it dining or driving a car) were made comparable, framed as instances of "energy use." They could all be measured in terms of energy expenditure and efficiency. Energy is "a unit of equivalence", Daggett writes (p. 47), that subsumes other ways of knowing the world into a matrix of conservation and conversion. Rendered energy use, all practices come to share the same economic logic that characterized the efforts of maximizing the productivity of the steam engine in Victorian Britain. Daggett also points out that the energy forms seen as "useful" in society changes historically and across space, and ultimately, the definition of utility is a question of power, open to political contestation. On several occasions, Daggett points the reader towards the work of Walter Mignolo, decolonial debates and marginalized ways of conceptualizing energy. Yet the question remains open what these other ways are. By providing a careful history of energy through the work of Scottish physicists, the energy idea only appears as a product of Western industrialism. The question, then, is if there are other ways of knowing *energy*, beside concepts of work and waste, or if any notion of energy itself reproduces a Western standpoint. How would the decolonial argument cause us to rethink—perhaps unthink—energy in order to explore other epistemologies of (socio)nature? To know *energy* differently may lead to esoteric, animistic perspectives. However, as a vital force imbued in matter, "energy" is a very different phenomenon from that which reveals the ecological impetus behind increasing oil production and carbon emissions. It would be very interesting to have a discussion of "energy" in relation to notions of coloniality and non-Western epistemologies.

In the concluding chapter, the book changes character to become more speculative. Victorian Glasgow and the British Empire are left behind for the concerns of the present day. The argument here resonates with calls for degrowth in important ways. "Material degrowth is easy to grasp", Susan Paulson has argued in this *Journal*, mobilizing several energetic concepts:

...it simply means decreasing the quantity of matter and energy transformed each day by the metabolism of human society. In thermodynamic terms, recent boosts in societal metabolism have greatly accelerated anthropogenic entropy, resulting in an array of unwanted outcomes. (Paulson 2017: 428)

Daggett, however, challenges the thermodynamic metaphors used by Paulson and other degrowth scholars in analyzing the material economy. Thermodynamics has naturalized an understanding of fossil fuel use and waged labor as socially necessary, and its conceptual apparatus reproduces the work imperative in capitalist economies. In contrast, Daggett draws on feminist post-work politics to outline an alternative perspective. Universal Basic Income and shorter working days, she argues, are two strategies for undermining the productivist logic of thermodynamics. Instead of saving energy, we should give it up; instead of using energy more efficiently, we should "shift toward a practice of liberating energy from work" (p. 204). Life, then, could be organized outside the boundaries of work and fossil fuel use via reimagined notions of leisure, creativity, and value. However, while staying attentive to the history of thermodynamics, there is arguably much value in developing a politically informed analysis based on thermodynamic concepts. Political ecologists have done much over the past decades to criticize the use of ecological metaphors in social analysis. This work has shown that instead of using thermodynamic concepts to legitimize social practice, they can be mobilized to investigate how social and economic processes interact with ecology in the context of often multi-scalar power relations. The work on metabolism by urban political ecologists, blurring dualisms of unequal social life and its

material reproduction (e.g. Gandy 2004), and on entropy in the context of international political economy (cf. Cederlöf 2019) stand out as key examples. By eliminating the energy idea, we risk losing a vocabulary for a scarcely offered, materially grounded political analysis and, indeed, progressive change. *The Birth of Energy* calls on us to think that this is a risk mainstream society needs to take and that energy itself is the problem.

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