

Current Thinking – An Introduction

Simone Abram, Durham University

Brit Winthereik, IT University of Copenhagen

Tom Yarrow, Durham University

Introduction

Since the 19th century, electricity and its various infrastructures have proliferated to the point where they now reach into every aspect of contemporary life. Whereas the first industrial revolution was helped along first and foremost by the steam engine, electricity was centrally implicated in the second (the rise of Fordist modes of production in the early twentieth century) and is now inextricable from far reaching and profoundly transformative socio-technical transformations. After a third industrial revolution associated with automation, ‘Industry 4.0’ is now being promoted strongly by European governments and industrial manufacturers, to connect producers and consumers through real-time digital networks (Bundesrepublik Deutschland 2014; EEF 2016). At the same time, counter-pressures to limit anthropogenic climate change caused by burning fossil fuels imply decarbonizing the energy system, and, not least, decarbonizing electricity grids and transport systems. This, in turn, is not a like-for-like replacement, but problematizes the workings of electricity grids, balancing of supply and demand, adapting to intermittent and distributed supplies, rethinking electricity storage, and working out how all this is to be financed in distributed,

competitive, and international markets. All of this raises doubts about the future of existing mass-generation infrastructures and demonstrates that any transition to more sustainable living is neither linear nor purely technical.

Such changes have significant effects on the everyday lives of people living in industrial societies as well as those who do not, generating forms of electricity-dependence that would have been unimaginable just a short time ago. In short, the majority of people in Europe and America at least live in what we might term an electromagnetic field to which we have become thoroughly habituated, and its scope is growing.

Pervasive, though by no means universally available or accessible, electricity nonetheless has qualities that makes it recede from view: it participates in daily routines familiar to the point they are taken for granted (Pink 2011), is channeled by infrastructures designed to conceal their workings, and is known through expert technical vocabularies with which few non-specialists are conversant, as well as through poetry and popular language. For scholars of the social sciences, the internalization of electrical metaphors to the imagination of ‘the social’ is not new, yet produces its own lacunae (Coleman this volume). *Current Thinking* aims to render electricity visible and interesting; a matter of concern to social sciences and the humanities. It seeks to pursue this aim by rendering electricity socially and materially lively, and by placing electricity firmly amidst everyday practices and politics. *Current Thinking* thus explores how electricity is not merely a resource for social life, but part and parcel of infrastructures in which people live. Taking inspiration from the growing field of infrastructure studies, we adopt a broad approach to infrastructures. Hence the title, *Current Thinking*, which points to electricity and electric infrastructures as phenomena increasingly embedded in the ‘ordering systems’, including the ontologies, by which we live.

Current Thinking demonstrates how ethnographic approaches to electricity may illuminate and transform an already spectacular scene of research on energy, infrastructures, identity, history, language, communication, and more. Analytically, we seek a subaltern approach to electricity production and use, which includes relativizing forms of authority and expertise which consider electricity as first and foremost a technical issue. Our discussion of electricity, as will be clear, is produced by the simultaneous ethnographic specificity and analytical variation presented. Framed by the deceptively simple question of what electricity actually is, we trace the multiplicity of practices by which it is produced, consumed, (re)-invented, and transformed.

Situating Electricity

Central to our approach is the proposition that electricity-in-practice is not a singular kind of thing, but a very varied phenomenon. The book collects chapters that explore electricity as tied into social and material infrastructure that can sometimes be sites of controversy. Studying electricity in a comparative way means paying attention to the language, metaphors, classification systems and devices used to deal with it in our daily lives as well as in engineering and policy work. It also means that readers who consider themselves to be ‘technical experts’ or ‘social experts’ must adopt an agnostic perspective on what electricity is, where it can be found, or how it can be researched.

The approach taken in the chapters departs in key respects from the two broad approaches taken in the past. Engineers, on the one hand, have sought to define how electricity can be used, in terms that have mostly isolated technical and infrastructural considerations from the ‘social contexts’ of various users, as well as from their own epistemic practices (Marvin, Chappells & Guy 1999; Danezis & Rial 2011). Social scientists, in contrast, have tended to focus on ‘social context’ specifically in relation to practices of consumption, in terms that do little to illuminate what electricity actually is (Shove and Walker 2014; Miller et al. 2013). Here, in contrast, we are inspired

by a small body of existing work that seeks to describe and analyze electricity-in-practice with attention to both infrastructural, epistemic, political and material elements (Winther 2010, 2012; Rupp 2016; Wallenborn & Wilhite 2014; Anusas & Ingold 2015; Boyer 2015; Schick & Winthereik 2013) to add renewed impetus to efforts to move beyond binary framings of electricity as a variously social or technical entity. Such work has been inspired by social studies of science and technology and by the anthropological approaches intrinsic to the debates around actor-network theory (Latour 1986; Mol & Law 2002; Jensen 2010; Holbraad and Pedersen 2017, Yarrow, Candea, Trundle & Cook 2015)

Contributors to the volume come from a range of conceptual and disciplinary traditions, including anthropology, STS, geography and history, but are unified by the collective aim of better understanding how electricity is formed and what it forms. Rather than treat this as a stable or singular object we demonstrate how electricity implicates people in diverse forms of subjectification and objectification that reflect and reconfigure the lives of those involved, including through concerns with identity, emotion, ideology, language, ethics and knowledge.

Our efforts to understand how electricity is activated through specific articulations of concepts, practices, meanings, materials and infrastructure build on various conceptual approaches, as we demonstrate how electricity is involved in understandings, practices and concerns as diverse as life itself. Our borrowings are deliberately and un-apologetically broad, and do not in the final analysis resolve across chapters. Borrowing from some classic literatures, including on religion (Durkheim 1968), totemism (Lévi-Strauss 1962) and kinship, helps re-situate classic concepts and insights.

Electricity's manifestations are so diverse and abundant that we inevitably have to deal with a broad range of conceptual approaches, but our efforts towards more syncretic

understanding have developed through close dialogue with one another, and with a number of literatures. Broadly inspired by post-human thinkers (Hayles 1999; Pickering 1992), we pay close empirical attention to the various ways in which ‘the social’ and ‘technical’ elements of electricity are inter-defined, imbricated and distinguished. Electricity, not strictly a source of energy, but rather a medium of energy transmission, itself changes our bodies¹ as well as modes of organizing society. Without thinking about electricity as and in materials we fail to see how ‘it’ shapes ontologies and is shaped by them in return (Bille & Sørensen 2007).² In rejecting binary distinctions between the social and the material, we also have to think about the relationship between electricity’s material properties and its manifestations in social and political worlds.

Extending recent interdisciplinary work on infrastructure (Furlong 2010; Chalfin 2016; Harvey, Jensen & Morita 2017), we highlight how electricity divides and connects through the material circumstances and technical arrangements that enable certain modes of stabilization and commodification. This focus brings to light a number of practices that have received limited attention, and by the same token extends the conceptual repertoire of existing work: electrical infrastructures matter in specific ways as responses to the evanescent qualities of electricity itself.

What this volume seeks to add to the existing literature is a number of ethnographic studies and descriptions of electricity. From the case descriptions of how electricity is multiply enacted, the contributors offer vocabularies and concepts that can energise our scholarly and conceptual thinking around electrification of social life and infrastructures, and raise a series of questions. How can the host of new roles for electricity in social and cultural life be acknowledged? How can we speak about ‘it’ in its own right acknowledging that electricity is not one thing, and not even ‘a thing’ (Bakke this volume)? Through attending to electricity practices in many different places, the chapters all contribute alternative vocabulary to the engineering language. The question

is whether, taken as a whole, they also contribute the contours of a new grammar for analysing electricity.

All of the analyses walk a fine line between seeking not to lose the knowledge that science has already gathered and staying true to all the things we do not know much about, such as electricity's political agency and the richness of action at the edges of electricity networks. A real strength of the contributions is that they manage to steer clear of a division between a 'real', scientific version of electricity on the one hand and a socially and culturally constructed version on the other. Instead they are seen as intertwined. If, as Kirscher and Power claim (this volume), 'energy infrastructure materializes state power and authority', then once again our attention to the materialities of electricity and its equipments remains crucial, but how to do it remains problematic. As they argue, Ferguson alerted us many years ago to the reliance of 'anti-politics machines' on the presentation of political projects as technical procedures (1990), and our drive is patently not to reduce complex socio-technical worlds to apolitical technological problems. Focusing on material things may carry related risks, however. Jensen (this volume) points to Jane Bennett's focus on the many and diverse actual material things that make up something as complex as the infrastructure of an electrical grid and her arguments that these must be understood as heterogeneous networks of objects. But as Jensen argues, Bennett's approach ignores the observation that 'things and people are *all* internally heterogeneous, since all are shaped by emergent relations, entanglements and arrangements'. Instead, Jensen suggests taking as a departure point Isabelle Stengers' (1999) refusal to purify the force of things or the actions of people.

Articulations of electrification

We now outline some of the developments – recent and less so – that have made electricity matter in new and pressing ways. Before electricity became a consumer good, experimentation with electricity had taken place for centuries. It was in the nineteenth century that engineers reached the basic theoretical understanding of electricity that we continue to use today, and around that time expertise on electricity began to solidify. Ever since then, electrical applications have continued to develop, and electrical installations have grown and transformed. In much of the so-called developed world (although with notable exceptions), several decades of increasingly large scale power generation installations removed electricity generation from the domestic and communal domains towards a national or international scope. Increasingly large coal-fired power stations with huge cooling towers were built onto transmission networks, massive nuclear power stations loomed large on some coastal horizons, and electricity pylons drew patterns on the landscape, holding electricity generation at a distance high above and beyond the everyday and very far from its domestic consumers. These developments put electricity grids centre stage in our ethnographic approach to electricity.

Recent attempts to include more renewable energy sources in electricity grids, fueled among other things by green societal transitions, have helped to bring electricity down to a human scale and highlight the parallel histories of domestic and community-scale generation. Pioneers of the alternative electricity systems showed how to build DIY solar heating and electrical mini-grids³, enabling enthusiastic independent householders to adapt their own dwellings. Since then, manufactured household technologies like solar panels or heat pumps have caught up and dropped in price, enabling non-experts to install their own generation equipment at home, in small businesses or by and for community groups. Wind turbines, solar panels, heat pumps, incinerators that turn waste into electricity, battery packs and electric vehicles are some of the electric

technologies that facilitate everyday interaction with electricity and help to make electricity into a matter of increased public concern.

Electricity demands a unique kind of infrastructure of networks, links and grids at contrasting scales and dimensions (from circuit boards to international power-cables), requiring harmonization, surveillance, maintenance and management between states, geographical regions, commercial and public institutions, and between citizens and economies of all kinds. Electricity can be bought, sold and stolen, generated, captured and transformed (Golden & Min 2012; Min & Golden 2014). It is generated, distributed and used locally and across global connections that are physical, virtual, economic and political, and often ambivalent (Arora 2007). A growing body of ethnographic readings has helped contextualize these ambivalences and confront technical and political assumptions about 'consumers', 'customers', 'prosumers', 'users' or 'providers' (Jakobson 2007; Winther 2012; Wilhite 2012; Rupp 2016; Ulsrud et al. 2015). Such work reveals how electricity is not a single stable technical object in need of added social context. Rather, electricity is located and produced through bodies, materials, concepts, technology, and propelled by various logics, as Cross (this volume) makes abundantly clear.

While in the twenty-first century electricity is changing in infrastructural impact and is gaining public attention, electricity is also increasingly politically charged (Summerton 2004; Breslau 2011). Concerns about electricity are starting to overshadow debates about oil (both in terms of its environmental consequences and in relation to oil as a finite resource), as the technical and social consequences of the shift to renewable sources emerge. In particular, the materialities of renewable sources of electricity are bringing in widely distributed generation capacity that values new supply-chains, primary resources and geo-political structures, while placing quite different demands on national energy grids that call for new thoughts about the government of electricity.

Throughout much of the latter twentieth century, Western electricity users have largely been able to access as much electricity as they can pay for. Behind this plenitude lay a complex system of grid management, ensuring that instantaneous supply and demand could be matched. This relied on large-scale producers and consumers (i.e. industrial consumers) entering into agreements, such that large power stations could be managed as demand switched through diurnal and weekly cycles from industrial uses to domestic uses. We need not go into details of grid histories or technologies here, but suffice it to say that the demise of large-scale manufacturing in much of Europe and the US, and the move from large power stations to smaller dispersed generating equipment raises complex challenges for the operation of a grid⁴. Electricity infrastructures, policies, systems and markets vary considerably between countries, but general trends are being seen across the globe towards competitive markets for electricity rather than state-owned and operated infrastructure, and the move to increasingly finely distributed generation. Changes to infrastructure are also neither singular nor linear. At the same time as generation is increasingly dispersed, grid connections have been undergoing their own form of globalisation, becoming less nationally-focused – not least through international inter-connectors that join not only grids but also through electricity markets that allow for trade across national boundaries. In some cases, grids are better connected between nations than within⁵. In this complexifying context, citizens' assumptions about accessing abundant electricity at any time are now being questioned⁶.

In contrast, in many non-Western countries electricity supplies have been intermittent and often unpredictable. Access to grid-energy becomes entangled in political structures that often distribute supplies unequally. Kirschner and Power (this volume) argue that electricity has been used in developing states as a means of state control. Cross (this volume) shows how provision of electricity has been integral to notions of modernisation and development for the Indian state. The

coming of electricity 'lines' and the provision of 'current' through these lines articulate the social politics of rural life. Talking about current in this context offers a discourse that spans well beyond electricity itself, "rich with allegorical or metaphorical possibilities for talking about modernity and development, life and death, kinship and fraternity, love and sexuality". When the current fails and where it is not supplied, electrical infrastructure highlights its absence and the exclusion of some from the benevolence of the state.

For electricity consumers, messages are more mixed than ever. Manufacturers urge us to consume more – more gadgets, more appliances, more electrical activity. (Some) governments urge consumers to reduce their consumption, while consumer organizations want lower prices to bring people out of energy vulnerability. These forces conspire to create maximizing customers out of cost-insensitive consumers, while pushing the unreflective consumers of yesteryear to become aware of their consumption (Brown 2015).

For the engineers and economists largely tasked with re-balancing a transforming grid, the idea of pricing as a means to change behaviour is appealing. Hence the idea of 'smart grids', and 'smart meters' has become extremely popular among policy-makers and industry as a technical solution to emerging grid problems (Marvin et al. 1999; Danezis & Rial 2011; Nyborg & Røpke 2013). Making consumption visible has been seen as a first step towards achieving this, but while the search has begun for the rational households that will adjust their consumption patterns and help balance the load in an overheated system, there are numerous complications. One of them relates to the ways people are figured in the system, imagined either as reflexively adjusting to pricing mechanisms (and being in charge of consumption) or as resistant to change (and thus unresponsive) (Strengers 2012; Schick & Winthereik 2013). Another complication relates to the lack of attention paid by grid technologists to the actual material setup of energy supplies and the differences to be

found between theorized models and lived practices, and between different systems, despite an emerging supply of knowledge on this theme.

These questions about changing electrical infrastructure matter now not least because so much of the world's population is increasingly dependent on electricity supply. Modern hospitals are so reliant on electricity that they are normally installed with dedicated emergency generators in case of grid failure, and are prioritized when general electricity supply is restricted. In war zones, cuts in electricity supply, including cuts in diesel supply for generators that run autoclaves, ultrasound scanners, centrifuges and other hospital equipment can hasten or cause deaths. The targeting of medical centres in recent conflicts (Herbermann & Fleck 2017), and a long history of wartime targeting of electrical infrastructure show how politically important electricity is, given the increasing dependence of all sorts of infrastructures on electric supplies.

Electricity is so pervasive in the centres of power that access to electricity is promoted by international organisations such as the UN as a kind of human right, a basic essential for 'civilized' life (Winther 2010). Access to electricity is indeed globally very uneven, both in terms of geographical spread and stability and security of service in particular states, and in terms of affordability of access, although some argue that rather than a simple concern for equal access to restricted goods, claims such as the UN's contribute to a colonialist normalisation of Western priorities (Shove 2003). Among energy vulnerabilities that are now recognized, lack of access, or unreliable access to electricity has particular features that relate to the forms of electricity itself and the appliances, machines and plant that are used to generate, convey and use it. Yet paradoxically, for some Westerners it is a life off-grid that is now an ideal.⁷ Recognizing the degree to which grid-connections are tied into specific socio-political and economic frameworks, those seeking alternative non-capitalist lifestyles may choose to go off grid altogether. This does not necessarily

mean rejecting electrical services, however, and as Forde shows, being technologically innovative in relation to electricity can be aligned with a rejection of grid-connection, while it is also possible to overlook the provenance of components and their derivation from the markets that are being rejected (Forde 2016). Rejection of the grid can thus be a form of rejection of the political status quo. Indeed, as Luque-Ayala and Silver show, a spatial focus on electricity, and in particular an urban focus shows how various forms of urban grid can become the site of protest as well as power (2016).

Summing up this historical section, after a century of domestication, electricity is socialized and politically embedded in ways that now require sustained empirical attention including to the ways its histories and futures are performed (Gupta 2015; Möllers & Zachmann 2012). One of the important tasks following from this is close study of *who* is doing this performing. Certainly, electricity has been brought to public attention as a concern, but is also often dealt with by experts behind closed doors. Lack of transparency is not only a matter of who has the technical expertise or whether electrical matters can spark publics into being (Marres 2014). It is also a matter of the ways in which particular historical renderings of electricity have spurred our current thinking. As others have already pointed out, just because certain practices have become naturalized, this doesn't make them universal. Hard-wired into our current thinking are demonstrations of electricity in which its dangers have been highlighted, and in which a strong link between science and engineering has been performed (Schiffer 2005; Shamir 2013; French 2017). But with renewability high on some national and industrial actors' agenda (DONG Energy recent sold all its off-shore operations in Denmark and is investing massively in renewable energy production in Northern UK), and with an upcoming IT and robotics revolution in some parts of the world, we need new resources for articulating what electrification means.

The structure and themes of the book

In proposing an anthropologically-informed approach to electricity, we acknowledge that different research methods materialize their research objects differently (Sovacool 2010). The book includes accounts that draw on historical methods, textual analyses, participant observation and interviews. In various ways, these are enlisted in the service of understanding what electricity is and means to those people who are the empirical focus of enquiry. Ethnography attunes attention to these empirical circumstances in specific ways, locating what people know or claim in relation to the practical circumstances of their everyday lives. Descriptions of what electricity 'is' are presented as necessarily indissoluble from considerations of where, when, how, who and by what means it is made to be so. Our ethnographic focus extends to the various experts involved in the production of electric knowledge and infrastructure, as much as to the 'consumers', who are more routinely the subject of social scientific attention. While all accounts share a common understanding of the indissolubility of concepts from practice, different disciplinary, methodological and analytic commitments train attention in distinct ways. Taking a clue from Nye (1999) the contributors to this volume consider electricity as a participant in societal transformations on larger as well as smaller scales. As electricity is becoming a visible concern in people's lives, and a new political force, we ask what are the emerging forms of interpreting, managing and imagining electricity and our future with 'it'? How do reconfigured electricity practices make particular electricity present and groom particular energy futures?

Gretchen Bakke's chapter offers us a way to address such questions, with an incisive analysis of the linguistic limits to our apprehension of the grammatical form of the indefinite. In

Bakke's terms, electricity evades the nominative form of language, and escapes the genitive: neither noun nor verb, yet European languages constantly urge a *thingization* of something so ephemeral as an electromagnetic field.

As Bakke shows, while anthropologists have embraced the idea that things are good to think with, its converse is that non-things are difficult to think at all. Electricity provides a challenge in being just such a non-thing. We barely know what electricity is, she argues, even if we are increasingly familiar with its effects (largely true for scientists as well as social scientists). As a result, we can talk about electricity's effects, but we often do this as if we are talking about electricity itself, which we are, in fact, not doing. Instead, popular discourse, for example, includes a plethora of metaphors applied to electricity, with flow as only the most common. Electricity does not flow; nor do electrons; this much is certainly known. When engineers talk about a flow of charge, on the other hand, they knowingly adopt the methods of Physics and its use of models and metaphors that serve explanatory purpose without being direct representations of material phenomena.

Coleman's chapter continues the exploration of electricity as inspiration for language and brings metaphor firmly to the fore. As Coleman shows, early humanities scholars were not slow to adopt electrical metaphors into their vocabulary. For scholars of religion, in particular, the idea of an invisible force with palpable effects was enticing. In what Coleman describes as a 'scholarly pedigree in biblical criticism', analogies between mechanical and divine energy offered an attractive model, inspiring Durkheim's attempts to explain the 'forces' of social action. Indeed, Coleman describes a 'constant "signals traffic" between religion, natural science, and the burgeoning human or "moral" sciences' of the nineteenth and early twentieth centuries. A flourishing world of experimentation generated unified fields of positive science such as

‘psychophysics’, which built on the idea of energy and vital forces. Curiously, as Coleman notes, such unified science inquired into humans as biological organisms including their thought processes and the development of the species. While this holism or seepage between disciplines receded throughout the century, recent work on man-made planet-scale geological changes known as the Anthropocene brings holism centre stage across the human and physical sciences, thrusting scholars, again, into dialogue across, through or around disciplinary boundaries.

Bakke and Coleman are both concerned with approaching infrastructures as materializations of collectives that are both human and material. As Bakke explains, since it is easier to think and talk about things, a focus on materialities – concrete stuff of the Grid, electrical appliances, and so forth – makes electricity available through its effects. A focus on effects, and on ‘being affected’ offers a way to shift the focus to relations rather than objects. Vinciane Despret, for example, has built on Haraway to think about being affected by something only partially within reach. In Despret and Haraway’s renderings, being affected is not about empathic relationships, but about ‘creating the possibility to inscribe oneself in a relation of exchange and proximity that has nothing to do with identification’ (Despret 2016, 17).

As well as being good to think with, Cross’s chapter shows how electrical current can be good to talk with, and how talk about current links local conditions to broader political debates. The visibility of grid infrastructure that supplies electricity to some and not others reminds people of the inequalities suffered on a daily basis among sectors of the Indian population, particularly in rural areas where geographical separation reinforces social segregations. The lights visible from dark houses make inequalities apparent and lend metaphorical richness to the language of power. Perhaps surprisingly, access to off-grid energy through India’s solar revolution, does not dissipate these disparities, but reinforces the differences in access.

Sometimes the concrete description of a specific practice can illustrate this kind of inscription. Ortar transports us to a university city in the south of France, inviting us to take a sensual-ethnographic approach to the electrical. Focusing on the experience of riding her electric bike, Ortar unpacks the bike in terms of the effects riding it had on the organization of her day, the temporalities it invokes, hers-and-its bodily energy as a particular edge of the grid system. Ortar's account is of a relatively happy configuration of power and person, a benign encounter with varied infrastructures experienced through the sensuality of movement. The thematic focus in Ortar's chapter is on everyday experiences of electricity and on the embodied nature of 'living electrically'.

In contrast to inscribing bodies as situated edges of specific power grids, Hiroki's account of the changing charging-systems for electricity use in Japan shows how simple technical expectations can foster far from benign outcomes. In contrast to the Insull-inspired use of meters to implicate electricity into financial infrastructures in America, Japanese households were charged by the light-socket. As people found ingenious ways to multiply their socket-connections, they were criminalized by the systemic response to their creativity. Hiroki's chapter reminds us how access to energy services like electricity have been implicated in economic and political structures that entail punitive consequences. These early forms of rationing, in contrast to the classic Western rationing-by-price, make apparent the cultural forms of organization and institutionalization of electric services, but they also illustrate the significance of the metaphors and models that are put in place to enact electrical effects, and how these accrue reality in practice. Hiroki's focus on relationality brings us closer to electricity and its hybridity, and indicates an important theme for the book: Infrastructures as both set in time and space and as sites for experimentation.

Jensen also analyzes part of an electrical infrastructure as he seeks to 'deal anthropologically with the force of things'. The construction of hundreds of dams along the

Mekong River relies on many different kinds of models, but in particular it requires some convergence between hydrological river models and electrical and economic plans. His description of the models-in-practice shows us different ways in which the Mekong River can be known. The river is different in each model, becoming a kind of river-multiple, as it is known through multiple different and differently partial models. Model-makers themselves know the flaws of their models, but rarely reject their explanatory power (c.f. Abram et al. 1998). As models are used for planning purposes they adopt electric ontologies and start to become about economic ‘flows and currents’. In practice, as Jensen shows, the electric world is full of cuts, conversions and transformations. Models are restricted – therein lies both their value as models and their weakness as partial representations – but it is the promotion of some aspects over others that can have such deleterious and political effects. It is not so much that models reveal some things and conceal others, but which of those things are revealed and concealed, that requires attention.

In their chapter, Kirshner and Power put it more bluntly: in sub-Saharan Africa, more specifically Mozambique, “energy production and use translates into control over space, and energy and its supporting infrastructure becomes a means for states to express their authority, extend their reach and consolidate territorial control”. Using the tools of political-economy, they argue that state control (or lack of control) of electricity grids has effects on relations between citizens and state, shaping forms of governance. State power and electric power are related, sometimes quite directly. Yet the state’s efforts to control power (in both senses) are as uneven and incomplete as the country’s electrical infrastructure. The state holds out the promise of providing electricity to the citizens, but its failure to deliver on the promise has the counter-effect of alienating large parts of the population. Kirschner and Power show how dams in Mozambique became the focus for competing factions during the civil war, defining the dam variously in terms of the progress of high

Modernism, a symbol of Portuguese colonial power, or as a national asset vital to the success of a liberated country. The dam became a site of struggle precisely because of the link between electric power and political power on a geo-political stage, a battle that played out through civil war attacks on the transmission lines connecting the dam to the rest of the country, as well as the dam itself. The country's obligations to international contracts and the reflection of colonial history in the shape of the electricity infrastructure mean that the citizens see little benefit from the dam's productive power. Subsequent liberalization of the electricity network exacerbated the unevenness, and reinforces the geopolitical pressures on the country's energy infrastructures. While UN and World Bank powers over the state continue to shape the electricity sector, the state's hold over citizens remains as uneven as their access to electricity.

Geopolitical considerations also figure in Özden-Schilling's chapter, but in a somewhat different way. Given this broader reach of the grid of electricity generation, transmission, governance, political relations, and financial flows, Özden-Schilling asks us to think about what she terms the Big Grid; the Grid beyond the infrastructure of the electricity-grid itself. She shows us how US grid development has been intimately entwined with the development of the notion of Big Data as scientists and engineers sought to address optimization problems. As the ability to solve these problems has developed, the opportunity to use that problem-solving has itself enabled rapid optimization techniques that have in turn afforded new financial trading opportunities in the electricity markets. While Özden-Schilling does not claim that big grids are the direct precursor to big data, she shows how grid-like thinking began to pervade engineering specialisms, and she shows us how the increasing scale of grid-thinking permeates contemporary life through a description of a famous widespread blackout in the Northeast USA. Özden-Schilling also ventures into the questions around the idea of a smart grid, and the depth of socialization involved in

imagining, preparing for and ultimately attempting to implement multiply-networked and agented grid systems.

The prospect of controlling integrated grids – that is, where control of supply to specific appliances or users is in the hands of system operators rather than in the hands of consumers/owners/users – raises far-reaching questions about the kinds of political-economy issues raised by Kirshner and Power. Both Kirshner and Power and Özden-Schilling point to the massive amounts of ahead to consider the relations between centralization and dispersal, state control, regulation, financial investment or empowerment with respect to national electricity grids. Questions around (de)centralization of energy systems will not be tackled heads-on by this book. However, the approach taken by Loloum is helpful to consider how particular institutions in the electrical system communicate desired perceptions of themselves. Loloum offers us an intriguing glimpse into the public promotion of the electricity world's biggest beasts: nuclear power stations.

By combining an experiential approach with the forthright statement of state scientific power that is the nuclear power station, Loloum reminds us of the placement of electrical infrastructure in the technological sublime. Dams such as those discussed in chapters by Jensen and Kirshner and Power have long been central to this powerful aesthetic, with images of the Aswan and Hoover Dams carrying particular potency as images of modernity and progress in their time. Visiting dams or nuclear power stations as a tourist constitutes the visitor as a particular kind of subject, subject to the instrumental and symbolic safety procedures, checks and warnings that constitute a nuclear governmentality. Loloum also draws on David Nye's observations that the American technological sublime is destined to be experienced not by individuals but by groups of tourists joining excursions to view the great achievements of science fulfilled by the state and capital (1996). Nye's particular focus on the 'electrical sublime', through dazzling electric lighting

that stunned early audiences, highlights the cleanliness often associated with electricity as a form of power.

EdF and other companies enroll their infrastructure quite explicitly in the political project of PR, hoping to generate public support for investment in nuclear power. Notwithstanding the abundant pollution caused by electrical power plant, great efforts are taken to present electricity as clean and safe, and particularly so at that most notoriously risky location, the nuclear plant. The power to control such incipient danger only adds to the effect of awe and the frisson of averted danger for the spectator/visitor, making the visit in many ways an archetypal tourism experience despite – or perhaps precisely because of – the extremely utilitarian design of the plant. The nuclear power station becomes a spectacle whose surface of scientific authority and engineering sophistication can be admired, while the painful and often exploitative chains and networks of supply of its resources are well hidden from view in a partial narrative of the kind highlighted above. Scholars of tourism are familiar with the Goffmanian notion of front-stages and back-stages, the performance of place and identity for tourism purposes, and the partiality of the performance that tourists willingly, if not eagerly, experience. Variations of this partiality can be recognized in the presentation of electrical effects in the various models, narratives and discourses noted here.

Thinking through Electricity

What might it mean to ‘know’ electricity anthropologically? In some sense it is about having fuses and splices that don’t match the epistemic practices through which electricity has been performed in Science and Engineering. It might also be about knowing that, as anthropologists, we are aware of the complexity in ‘fixing it up’, as Joni Mitchell puts it in the song ‘Electricity’⁸. What kinds of expertise and knowledge relate to electricity, and how should we (mutually) approach those areas

that we do not entirely understand? If our work is in re-describing electricity (see Lebener 2017), how might we access the variety of knowledges without privileging any in particular as we seek to explore diverse possibilities of meaning? Anthropology excels in considering diverse ways of knowing, but scientific expertise itself often poses a particular challenge, and this is exemplified in scientific and engineering expertise about electricity. This is not an easy challenge and raises a number of questions. For example, if we adopt the language of engineers, can we then think critically about the social and ethical assumptions build into engineering approaches? If we refuse the language of engineers and scientists, how do we acknowledge or incorporate their learning? If we reproduce the language of energy policy, where is the space for subaltern voices in setting energy agendas? How, in other words, do we find ways to discuss electricity that encompass knowledge about its technical capacities without capitulating to the socio-scientific implications of technical debates? How, as Bakke puts it, can we take electricity seriously in its own right (see also Holbraad & Pedersen 2017)?

As a whole, *Current Thinking* moves far beyond the creeping realization of how embedded electric power is in so many aspects of contemporary life. It moves beyond the idea of electricity as an immovable force, in the face of which our only option is to examine it's 'impact'. True, we need power to enliven our appliances, travel around or communicate, but this power is deeply enmeshed in linguistic practices, power politics, geo-political relations, metaphors and models of thought, and so on. What the book offers is a set of potential trajectories for thinking about electricity and its effects, of tying the thoughts of social scientists to the builders of dams, the geopolitical negotiators to the person flicking a light switch or the tourist hopping on an electric bike. Applying electricity to social science helps us diffract electricity (Haraway 1997) and

invigorate social science at the same time, challenging our most central assumptions and discourses, and opening new fields for exploration.

References

- Abram, S., J. Murdoch & T. Marsden. 1998. Planning by Numbers: migration and statistical governance. In P. Boyle & K. Halfacree (eds) *Migration into Rural Areas: Theories and Issues*. Chichester: Wiley. 236-251.
- Anusas, M. and T. Ingold 2015. The Charge Against Electricity. *Cultural Anthropology* 30(4): 540-554.
- Arora, V. 2007. Democracy and Dams in Sikkim. *Indian Sociological Review*.
- Bille, M. and T. F. Sørensen. 2007. An Anthropology of Luminosity. *Journal of Material Culture* Vol. 12(3): 263–284.
- Boyer, Dominic. 2015. Anthropology Electric. *Cultural Anthropology*. 30(4): 531-539.
- Breslau, Daniel. 2011. "What do Market Designers Do When They Design Markets? Economists as Consultants to the Redesign of Wholesale Electricity Markets in the U.S." Pp. 379-403 in *Social Knowledge in the Making*, edited by Charles Camic, Neil Gross, and Michèle Lamont. Chicago: University of Chicago Press.
- Brown, Wendy. 2015. *Undoing the Demos: Neoliberalism's Stealth Revolution*. New York: Zone Books.
- Bundesrepublikk Deutschland 2014. The new High-Tech Strategy: Innovations for Germany. Rostock: Publikationsversand der Bundesregierung.

https://www.bmbf.de/pub/HTS_Broschuere_eng.pdf (24.4.17)

Chalfin, B. 2016. 'Wastelandia': infrastructure and the commonwealth of waste in urban Ghana. *Ethnos*. Pp. 1-24.

Rial, A. and G. Danezis. 2011. Privacy-preserving Smart Metering. *WPES'11 October 17, 2011*.

Durkheim, Émile. 1968. *Les Formes élémentaires de la vie religieuse: Le système totémique en Australie*. 5ième ed. Paris: Presses universitaires de France.

EEF 2016. *The 4th Industrial Revolution: A Primer For Manufacturers*.

www.eef.org.uk/fourthindustrial (Accessed March 2017).

Ferguson James. 1990. *The AntiPolitics Machine: Development, Depoliticization and Bureaucratic power in Lesotho*, Cambridge: Cambridge University Press.

Forde, Elaine. 2016. *Planning regimes on and off the grid: low-impact dwelling, activism and the state in west Wales*. Doctoral Thesis, Goldsmiths College (University of London).

Furlong, K. 2010. Small technologies, big change: Rethinking infrastructure through STS and Geography. *Progress in Human Geography* 35(4): 460-482.

Golden, Miriam and Brian Min 2012. *Theft and Loss of Electricity in an Indian State*.

International Growth Centre working paper 12/0060.

Haraway, Donna. 1997.

Modest_Witness@Second_millennium.FemaleMan[©]Meets_OncoMouseTM: Feminism and technoscience. New York: Routledge.

Hayles, Kathrine. 1999. *How We Became Posthuman*. Chicago: University of Chicago Press.

- Herbermann, Jan Dirk and Fiona Fleck. 2017. Attacks depriving people of urgently needed health care. *Bull World Health Organ.* (95): 6–7. doi: <http://dx.doi.org/10.2471/BLT.17.020117> (accessed 24.4.17)
- Hu, J. et al. 2015. Combined magnetic fields accelerate bone-tendon junction injury healing through osteogenesis. *Scandinavian journal of medicine & science in sports.* (25) 3: 398-405.
- Jensen, Casper Bruun. 2010. *Ontologies for Developing Things: Making Health Care Futures Through Technology.* Rotterdam: Sense Publishers.
- Latour, Bruno and Steve Woolgar. 1986. *Laboratory Life: The Construction of Scientific Facts.* Princeton, N.J.: Princeton University Press.
- Law, John and Annemarie Mol. 2002. *Complexities: Social Studies of Knowledge Practices.* Durham: Duke University Press.
- Lévi -Strauss, Claude. 1962. *Totemism.* Boston: Beacon Press.
- Luque-Ayala, Andrés and Jonathan Silver (Eds.). 2016. *Energy, Power and Protest on the Urban Grid: Geographies of the Electric City.* Abingdon and NY: Routledge.
- Marres, Noortje. 2014. The Environmental Teapot and Other Loaded Household Objects: Reconnecting the politics of technology, issues and things. In: P. Harvey et al (Eds) *Objects and Materials: A Routledge Companion.* London and NY: Routledge.
- Marvin, S., H. Chappells, and S. Guy. 1999. Pathways of Smart Metering Development: Shaping environmental innovation. *Computers, Environment and Urban Systems.* 23: 109-126.
- Miller, Clark A., Alastair Iles & Christopher F. Jones. 2013. The Social Dimensions of Energy Transitions. *Science as Culture* (22) 2: 135-148.
- Min, Brian and Miriam Golden. 2014. Electoral cycles in electricity losses in India. *Energy policy* 65: 619-625.

- Mitchell, Joni. 1972. *Electricity. For the Roses*. Hollywood, California: A&M Studios.
- Mol, Annemarie. 2014. Language Trails: ‘Lekker’ and Its Pleasures. *Theory, Culture & Society* (31) 2-3, pp. 93-119. DOI: <https://doi.org/10.1177/0263276413499190>
- Mol, Annemarie. 2016. Clafoutis as a Composite: On Hanging Together Felicitously. In: John Law and Evelyn Ruppert (Eds.) *Modes of Knowing – Resources from the Baroque*. Manchester: Mattering Press.
- Möllers, Nina and Karin Zachmann (Eds.). 2012. *Past and Present Energy Societies: How energy connects politics, technologies and cultures*. New Bielefeld: Transcript verlag.
- Nyborg, Sophie, and Inge Røpke. 2015. “Heat Pumps in Denmark - From Ugly Duckling to White Swan.” *Energy Research and Social Science* 9 (September). Elsevier Ltd: 166–77.
doi:10.1016/j.erss.2015.08.021.
- Nye, David. 1994. *American Technological Sublime*. Cambridge, Mass; London: MIT Press.
- Nye, David. 1999. *Consuming Power: A social history of American energies*. Cambridge, Mass; London: MIT Press.
- Pickering, Andrew. 1992. *Science as Practice and Culture*. Chicago: University of Chicago Press.
- Pink, S. 2011. Ethnography of the invisible. *Etnologia Europaea: Journal of European Ethnology* 41(1): 117-128.
- Ulsrud, K., T. Winther, D. Palit and H. Rohracher. 2015. Village-level solar power in Africa: Accelerating access to electricity services through a socio-technical design in Kenya. *Energy Research and Social Science*. 5: 34-44.
- Rupp, S. 2016. Circuits and currents: Dynamics of disruption in New York City blackouts. *Economic Anthropology*. 3: 106-118.
- Schick, L. and B. Winthereik. 2013. Innovating Relations – or Why Smart Grid is not too Complex for the Public. *Science & Technology Studies*. 26(3): 82-102.

- Schiffer, Michael Brian. 2005. The Electric Lighthouse in the Nineteenth Century. *Technology and Culture*. 46(2): 275.
- Shamir, Ronen. 2013. *Current Flow: The Electrification of Palestine* Stanford: Stanford University Press.
- Shove, E. 2003. *Comfort, cleanliness and convenience: The social organization of normality*. Oxford and New York, NY: Berg.
- Shove, E. and G. Walker. 2014. What is Energy For? Social practice and energy demand. *Theory Culture & Society*. 31(5): 41-58.
- Summerton, J. 2004. Do Electrons have Politics? Constructing user identities in Swedish electricity. *Science, Technology & Human Values*. 29(4): 486-511
- Wallenborn, G. and H. Wilhite. 2014. Rethinking Embodied Knowledge and Household Consumption. *Energy Research and Social Science*. 1(2014): 56-64.
- Ward, Andrew. 2016. Regulator warns that guaranteed electricity may come at a cost. *Financial Times* 12 December 2016. <https://www.ft.com/content/17d8da20-c049-11e6-9bca-2b93a6856354> (Accessed 24.4.17).
- Winther, T. 2010. *The Impact of Electricity: Development, Desires and Dilemmas*, London and New York, Berghahn.
- Winther, Tanja. 2012. "Electricity Theft as a Relational Issue: A Comparative Look at Zanzibar, Tanzania, and the Sunderban Islands, India." *Energy for Sustainable Development* 16 (1): 111–19. doi:10.1016/j.esd.2011.11.002.
- Yarrow, T., M. Candea, C. Trundle & J. Cook (Eds.). 2015. *Detachment: Essays on the Limits of*

Relational Thinking. Manchester: Manchester University Press.

Zhang, J. et al. 2014. The effects of static magnetic fields on bone. *Progress in biophysics & molecular biology*. (114)3: 146-152.

¹ Magnetic fields have significant medical effects, for example, in healing wounds or reorienting bones (see Zhang et al. 2014; and Hu et al. 2015 for applications) as well as more secondary changes effected by the use of electrical appliances.

² We are painfully aware that our subaltern approach to electric metaphors is limited by and limited to the descriptions made possible by the English language (Mol 2014; Mol 2016).

³ E.g. in Britain, at the Centre for Alternative Technology: <https://content.cat.org.uk/index.php/how-cat-started> (accessed 24.4.17)

⁴ See www.ncl.ac.uk/cesi or www.ukerc.ac.uk for further information.

⁵ For example, the interconnector between mainland Scotland and the Orkney islands is too low-grade to transfer Orkney's abundant renewable energy production; connections between mainland Greece and other EU countries is better in some instances than connections to the Greek islands.

⁶ See Ward 2016

⁷ See for example how communities in Canada seek alternatives to centralized supply <http://lifeoffgrid.ca/>

⁸ Joni Mitchell, *Electricity* (on the album, 'For the Roses', Hollywood, California: A&M Studios, 1972). see <http://jonimitchell.com/music/song.cfm?id=111> (accessed 11.10.18)