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Perspectives

Humans and stuff: Interweaving social and physical science in energy policy research

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ABSTRACT

I reflect on three issues in light of Adam Cooper's paper: the logic of relationships between physical and social sciences; the place of Schatzkian practice theory (SPT) here regarding energy research; and historical contingencies that bring different research and policy challenges in different epochs. The basic subject matter of physical science is inanimate materiality that is blindly subject to causal chains that are predictable, at least in principle, whereas humans are conscious agents who can initiate causality unpredictably. Nevertheless, studies of human action can give somewhat orderly results using either statistics or heuristics. SPT enables us to produce useful heuristics that link different domains of reality, and this can enable parameters of physics to be quantified in novel ways and, importantly, with a human face. But no matter how neat our theoretical rigor, we need to adapt our approaches to address historical contingencies – such as today's rapidly growing disparity between the richest 1% and the rest of us. Further, there is an important place for non-quantitative insights into humanity's journey towards a better life for all. We especially need to be careful to avoid quantitative tools of physics being used by elites to gain hegemony and power.

1. Introduction

Adam Cooper's paper [1] raises stimulating and important questions regarding possible policy impacts of social science energy consumption research. His main thesis is that a lack of engagement with physics and its measurement units in much of this work, particularly as published in *Energy Research & Social Science* (ERSS), reduces or nullifies its traction among policymakers.

I want to relate this concern to three quite basic issues: the logic of science, be it of the social or physical type; some implications for the type of practice theory that originates from Schatzki, commonly used in energy consumption studies; and historical contingencies that affect what is fashionable and what works in the present epoch.

My own academic and vocational background is interdisciplinary, including electrical engineering, social psychology, theology (including pastoral work), mathematics teaching and policy studies, and I now work in an economics faculty in Germany and an architecture faculty in the UK. In my early years there were constantly three different discussions going on in my head: how the physics worked, including diverse arrays of units and numbers; what people were up to and why; and what life and the universe are really for. These began to come together in a reasonably coherent way for the first time in my work as a church-appointed anti-nuclear activist in New Zealand in the 1980s. In one and the same public lecture I found myself explaining the numbers of what nukes can do to cities and ecospheres; addressing human issues of complacency, denial and potential for effective political engagement; and reflecting on philosophical issues such as what the destruction of humanity might mean. It is interesting that all the main political parties accepted the movement's precise legislative demands. Of course there were lots of pressures of different kinds influencing policymakers – as Mazur [2] and Castree and Waitt [3] point out, it takes more than just academic findings to move governments – but it helped that the movement and its academic wing won the arguments on all three levels in the New Zealand context [4,5].

My work of the past decade has been mostly in energy consumption, embracing technology, economics, consumer behavior and policymaker behavior, together with underlying theoretical issues that impinge on these. The same three types of discussion go on in the same head: material stuff; people; and issues of logic,

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truth, falsity and meaning – commonly given the grand title ‘philosophy’. As the above example is meant to illustrate, advancing our knowledge in areas like these will by no means guarantee we get the best policies, but it should at least provide formidable input to the thoughtful side of policymaking. Interrelations between those three areas of discussion inform most of what follows.

Section 2 discusses some issues in the logic of science, in an attempt to explain how it is possible to hold the ‘stuff’ of physics together with the personhood of human beings. Section 3 reflects on Schatzkian practice theory [6,7] as one response to this type of issue, and some avenues in which it could well develop. Section 4 attempts to put these issues into an historical context, since research and policy making happen within specific historical epochs and respond or fail to respond to different challenges at different times. Section 5 concludes and suggests possible implications for ERSS.

2. Physics and personhood

Since clever human persons and dumb physical, material things exist in the same universe, it might seem that similar rules should apply to both, so that some kind of grand unified theory would cover everything and form a basis for interdisciplinary science. But while both types of being have material features, there is actually a profound mystery at the heart of what makes them different. This is commonly termed the ‘hard problem of consciousness’ [8–10] – ‘hard’ because consciousness appears to be inexplicable if the universe is just made of physical stuff. People are *aware* of what is going on around them and can reflect on it with a fair degree of freedom, while material things like mountains, smart heating systems and even computers with the highest levels of ‘artificial intelligence’ cannot do this [11] (for reasons of space I leave non-human creatures out of the discussion, and also the rich debate on different attempts to solve or explain away the ‘hard’ problem).

This has implications in many directions. For practical research purposes and ultimately for energy policy making it is helpful to distinguish how *causality* happens in each of these two domains. Social theory has a long history of seeking to identify what causes people to behave as they do [12]. Clearly there are many different kinds of constraint on human action and freedom, such as entrenched social practices [13]; a person’s socio-technical environment [14]; inter-subjective norms, values and ‘rules’ coming from societal discourse [15–17]; and the individual’s own ingrained habits [18]. Despite such pressures and influences, what makes us human is that we are not just nodes in a chain of cause-and-effect, but are agents – beings who can *originate* a chain of causality, i.e. act and behave in ways that bear no relation to antecedent causes – while material things can only do what antecedent causes make them do. Rom Harré, a philosopher of science who has made major contributions in fields as diverse as chemistry and psychology, sets this out systematically in his critique of Bhaskar’s [17,20] critical realism [19]. Harré argues that causality in human personhood is fundamentally different from how it is in inanimate materiality. Materiality always behaves in accordance with antecedent causes – everything that happens does so because *it was made to happen by some other physical event*. A water droplet falls from the sky because gravity pulled it down. Its molecules formed from water vapor because changes in pressure and temperature acted on them, and so on back up the chain of physical causality. However, Mary drank the wine only because *she freely decided to do so*. She might just as well have poured it into the stir-fry, stored it in the fridge, or tipped it down the sink. Nothing actually *caused* her to act the way she did.

The implications for the two kinds of science are profound. With physics it is possible to say precisely how much of one kind of phenomenon (e.g. CO_2 emissions released) will occur if certain amounts of other physical phenomena occur (quantities of a particular grade of oil burnt, units of concrete made, etc.). But it is not possible to say with any precision how much CO_2 Mary’s actions will produce, because Mary herself may decide to act in many different ways. This is the case regardless of what social practices Mary is engaged in, what her values and attitudes are, what cultural discourses she regularly utters, what socio-technical environment she lives and moves in, and what her deeply ingrained personal habits are. There will always be inherent uncertainties built in to any kind of social science because Mary is a person, not a thing.

All is not lost for number-crunchers, however. Two useful approximate tools for social scientists are statistics and heuristics.

With statistics, we observe (large) numbers of Mary-like creatures and make judgements based on their past behaviors in relevant contexts, using carefully designed mathematical tools. With appropriate sample sizes, selected according to strict random probability theory, we can offer something close to predictions, and thereby recommend interventions to move people like Mary in directions desired by policy. Policymakers tend to like statistics, even about unpredictable creatures like Marys, because statistics have an air of hard science about them. However, reading large numbers of such studies leads to the disappointment that very few select their samples according to strict random probability theory, so their p-values and statements of significance are often highly questionable. The American Statistics Association also complains that very few engage with the ubiquitous problem of what level of ‘significance’ is significant for whom, even if the numbers are right [21]. In other words, social science papers using statistics need to move beyond the practice of simply stating something is significant because its p-value was 0.05 or less.

Nevertheless, in the end policymakers might find it quite helpful to hear that (for example), if people keep behaving as they have over the last 5 years, every 1% increase in energy efficiency of domestic heating systems is ‘highly likely’ (i.e. with 95% confidence) to produce only 2/3 the reduction in CO_2 emissions predicted by engineering calculations (a 33% ‘rebound effect’ – see [22,23]), because people tend to change their comfort preferences in reasonably predictable ways (on average) when efficiency increases lead to cheaper heating. A shortfall of 33% is large enough to warrant action even if it is highly approximate, unlike the finer differences in recent elections that have bedeviled pollsters.

Another approach within the broad spectrum of the sciences is heuristics. Harré [19] and Harré and Madden [24] argue that most science proceeds by the use of models. A scientist constructs a model in her head of what is going on, then tests the model by experiment or uses it on data collected in situ. While all such scientific models are inventions in researchers’ heads, it is possible to distinguish two distinct kinds: models that are intended to *represent* what is actually there, in or influencing the objects being tested or investigated (‘representational’ models); and models that are an attempt by the researcher to construct an orderly mental framework for thinking more clearly about data which is by its very nature too diverse and/or chaotic to behave with clearly identifiable lines of causality (‘heuristic’ models). The physical sciences use both kinds of models, but mostly the representational type. If, for example, a new insulation material is conceived, a scientist might theorize that particular features of its molecular structure would cause heat to conduct through it at a certain rate. When the material is finally made, the model can be tested with real heat and measurement. By contrast, heuristic models are not attempts to describe the way the world *is*, but to think straight about data and information which is far from straight, and to do so from perspectives and positions that the researcher finds socially relevant. This brings an important, extra dimension to research. It begins with a very human face. It admits that research on humans always involves