# 1 Preface to a quantum social science

**Why are we here?**

Almost from its inception as an academic discipline in 1919, International Relations (IR) has featured "Great Debates" about what we today would call the relationship between ideas and material conditions, human agency and social structures, and naturalist and anti-naturalist modes of inquiry. While often disparaged as mere "meta-theory," at least implicit positions on these essentially philosophical questions play an important role in the field. Intellectually, they structure our substantive theorizing, methods, empirical findings, and ultimately the normative and policy implications we draw from our research; and sociologically, they affect who we hire (and sometimes, fire), where we publish, and how we train our graduate students. Unfortunately, despite considerable disciplinary investment in meta-theory since the 1980s, from my own vantage point, as someone who has been involved in these debates for 25 years, I see no progress toward ending them. IR scholars have a better sense today of what the issues are and how, why, and when they matter, but the debates remain as intractable as ever. When it comes to the ontological and epistemological foundations of IR scholarship, we are in a "Land of Confusion"[1] from which escape is nowhere on the horizon.

Of course, the confusion is not IR's alone, but the social sciences' as a whole. Although over the years sociologists, economists, political scientists and others have acquired better data and statistical techniques that have significantly improved empirical understanding of trends and relationships in society, social scientists' ability to cumulate deeper, theoretical knowledge has lagged seriously behind. This is true even in economics, where despite greater theoretical homogeneity, vigorous heterodoxies survive. In contrast to physical sciences like chemistry or geology, where there is broad agreement on the nature of reality and how we should study it, in the social sciences there is no such

I am very grateful to Colin Wight for exceptionally detailed comments on a draft of this chapter, especially since he disagrees with the whole idea.

[1] If you'll pardon the reference to the 1986 hit by *Genesis*; cf. *Disturbed*'s 2005 cover.

consensus. As a result social scientific theories rarely die, and if they do, like zombies they inevitably come back to life later.

As I argue below, the reason for this state of affairs is that social phenomena are mind-dependent in a way that chemical elements and rocks are not, and as such do not present themselves directly to the senses. Thus, before social scientists can even "see" what they are studying they must make a number of philosophical assumptions about the mind that are easily contested by those who would make different ones.

In philosophy there is a long-standing suggestion[2] that when debates persist for many years with no discernible progress, this is because all sides are making an assumption that is in fact mistaken. If such an assumption could be identified in the philosophy of social science, then that might enable IR scholars and social scientists more generally to find the Undiscovered Country of philosophical clarity that has eluded us for so long. But what might it be?

My own "aha!" moment came in 2001 after reading Danah Zohar and Ian Marshall's book *The Quantum Society*, which I had picked up almost randomly at the University of Chicago bookstore.[3] Zohar and Marshall were writing for a general audience, so I did not find the discussion of social and political theory entirely satisfying. However, their basic idea – that the mind and social life are macroscopic quantum mechanical phenomena – hit me as just the kind of thesis that could help move philosophical debates in the social sciences forward. That is because it calls into question a foundational assumption taken for granted by all sides – namely that social life is governed by the laws of classical physics. I don't know if the conjecture is right, but I felt it deserved a more systematic treatment that could be subjected to serious academic scrutiny. That is what I have tried to do in this book. Doing so took much more space (and time!) than I expected, and so unlike my first book,[4] which was half philosophy and half IR, this one is all philosophy. So for my colleagues in IR, all I can offer here is the promise of a more IR-focused "volume 2" down the road. In the meantime, I hope they will find something of value in a book addressed to all social scientists.

## Introduction

The advent of quantum theory in the early twentieth century revolutionized physicists' description of reality. Exactly what conclusions should be drawn from that description of reality is still being debated today, but the theory is extraordinarily well confirmed and all sides agree on its basic findings. In particular, whereas mathematical symbols in classical physics correspond to the properties of real material objects and forces, in quantum physics they

[2] Due, I believe, to Frank Ramsey in the 1920s.
[3] See Zohar and Marshall (1994).
[4] See Wendt (1999).

represent only the probabilities of finding certain properties when they are measured. Moreover, these quantum probabilities, which are expressed by "wave functions," are completely unlike classical probabilities. Whereas the latter denote our ignorance about what is actually the case and as such are incomplete descriptions of reality, the former denote all that could even in principle be known about quantum systems. Despite its probabilistic character, in other words, the wave function is a *complete* description of a quantum system, until its measurement, at which point it "collapses" and just one, classical outcome is observed. So, unlike in classical physics, where we can safely assume that objects have, for example, a momentum or position even when we are not observing them, in quantum physics we have no basis for such an assumption. Wave functions are potential realities, not actual ones.[5]

Understanding how the indeterminate quantum world results in the determinate classical world – a process known as "decoherence" – is one of the deep mysteries of quantum theory. However, its immediate significance in the present context is that, although quantum mechanics subsumes classical physics, its practical applicability is generally thought to be confined to sub-atomic particles. Above that level, it has long been assumed that quantum effects wash out statistically, leaving the decohered world described by classical physics as an adequate approximation of macroscopic reality. That includes social life, the contemporary study of which, I argue below, is all based at least implicitly on the worldview of classical physics.

In this book I explore the possibility that this foundational assumption of social science is a mistake, by re-reading social science "through the quantum." More specifically, I argue that human beings and therefore social life exhibit quantum coherence – in effect, that we are walking wave functions. I intend the argument not as an analogy or metaphor, but as a realist claim about what people really are. Scholars have long pointed to a number of strong analogies between human and quantum processes: between free will and wave function collapse, the holism of meaning and non-locality, observer effects in psychological experiments and quantum measurement, and even double-entry accounting and quantum information.[6] These and other analogies are sufficiently suggestive that one might apply quantum thinking to social life simply on that basis.

While one could read this book entirely in that way, as an interesting analogy, my personal belief is that human beings *really are* quantum systems. I defend that belief explicitly only in the Conclusion, but the book as a whole

[5] While there is debate about the ontological status of the wave function, no one argues that it is real in the same sense as classical objects.

[6] See Brandt (1973), Rosenblum and Kuttner (1999), Bitbol (2002), Heelan (2004), Pylkkänen (2004), Filk and Müller (2009), Grandy (2010), Kuttner (2011) and – since you're probably wondering about the case of accounting – Fellingham and Schroeder (2006).

is written with a view toward showing how this hypothesis could possibly be true. This realist stance will take me into controversial, speculative and frankly dangerous territory that could be avoided by an analogical road to "quantum social science." However, it would also come at a cost, which is that it would make quantum theory just another tool for social scientists to pick up – or not – as they see fit, and bracket some of the theory's most profound potential implications. In contrast, if human beings really are quantum, then classical social science is founded on a mistake, and social life will therefore *require* a quantum framework for its proper understanding.

This is not the first call for a quantum social science. Already in 1927 – just weeks after the Solvay conference marking the culmination of the quantum revolution – the President of the American Political Science Association, William Bennett Munro, challenged social scientists to come to grips with the new physics.[7] Philip Mirowski argues that to a limited extent they did, in that its probabilistic "spirit" facilitated social scientists' embrace of statistical methods in the 1930s.[8] But until recently there has been almost no reflection on the significance of quantum theory itself for the social sciences. As if to drive home this neglect, the methods embraced in the 1930s were based on classical probability theory – which came from the *previous*, Newtonian revolution in physics – not quantum probability theory.

While the social sciences have prospered in the ensuing years, there is today a good reason to re-open the quantum question: growing experimental evidence that long-standing anomalies of human behavior can be predicted by "quantum decision theory." This is a quantized version of expected utility theory, which replaces the latter's either/or Boolean logic with the both/and logic of quantum probability theory.[9] Quantum decision theory predicts most[10] of the deviations from rational behavior found by Daniel Kahneman, Amos Tversky and others using expected utility theory as a baseline – order effects, preference reversals, the conjunction fallacy, the disjunction fallacy, and so on. Psychologists have devoted enormous energy to trying to explain these anomalies, but the results have been partial and theoretically ad hoc. In contrast, with a single axiomatic framework, quantum decision theory shows they are not anomalies at all, but precisely what we should expect. Prestigious journals like *Journal of Mathematical Psychology* (2009), *Behavioral and Brain Sciences* (Pothos and Busemeyer, 2013), and *Topics in Cognitive Science* (2014) have taken notice and devoted substantial space to this unfamiliar approach. While the theory is new and its larger reception remains to be seen, its findings are

[7] See Munro (1928). [8] See Mirowski (1989).
[9] See especially Busemeyer and Bruza (2012), which includes an accessible introduction to quantum theory, probability and logic.
[10] My sense is that this qualification is necessary only because the literature is so young that it has not been able to take up all the relevant anomalies; see Chapter 8.

extraordinary. Rarely in the social sciences has one theory explained so much that was so puzzling before.[11] Quantum decision theory seems as clear a case as one could hope for of progress in social science, not just within a research program, but from one research program to the next.[12]

But that's only the half of it. Quantum decision theorists have been cautious in speculating about the philosophical implications of their work, focusing instead on just proving that it predicts previously anomalous behavior. In doing so they have embraced what is known as "generalized" or "weak" quantum theory, which applies the quantum formalism to phenomena beyond the domain of physics – like social life – while remaining agnostic about what is going on underneath.[13] While this "as if" strategy has pragmatic attractions, it overlooks the fact that quantum decision theory's success at the behavioral level fulfills a key prediction of a controversial hypothesis about what is happening deep inside the brain: quantum consciousness theory, according to which *consciousness* is a macroscopic quantum phenomenon.[14] That could help solve one of the deepest mysteries of modern science: the mind–body problem, or how to explain consciousness in scientific terms.

Since the Enlightenment it has been assumed that to explain consciousness scientifically means showing how it is compatible with the worldview of classical physics. Classical physics implies a materialist ontology in which reality is ultimately made up of just matter and energy. It is therefore ironic that quantum wave functions are not *material* at all, at least not in any ordinary sense. This has led some philosophers of physics to argue that, far from materialism, quantum theory actually implies a panpsychist ontology: that consciousness goes "all the way down" to the sub-atomic level. Exploiting this possibility, quantum consciousness theorists have identified mechanisms in the brain that might allow this sub-atomic proto-consciousness to be amplified to the macroscopic level. Modern neuroscience can't test this claim yet, but one of its implications is that human behavior should have quantum characteristics, which quantum decision theory bears out. From this standpoint, in short, there is the possibility not only of a progressive problem shift in behavioral social science, but of a paradigmatic change in the modern scientific worldview.

Social scientists might reasonably doubt that a hoary philosophical controversy like the mind–body problem could be relevant to their work. Yet we have hoary controversies of our own. In social epistemology there is the

[11] Something similar may be starting to happen in the biological sciences with the emergence of "quantum biology," which I discuss in Chapter 7.
[12] See Lakatos (1970).
[13] See Atmanspacher et al. (2002) and Walach and von Stillfried (2011). Because it uses the formalism to make quantitative predictions I would say quantum decision theory goes beyond a purely analogical approach.
[14] See Chapter 7 and Atmanspacher (2011) for a recent overview.

"Explanation vs. Understanding" debate between naturalists or positivists,[15] who think there is no essential difference between physical and social science, and anti-naturalists or interpretivists who think there is because people act on meanings that must be interpreted.[16] In social ontology there is the "Agent–Structure" debate, between individualists who think that social structures can be reduced to the properties and interactions of individual agents, and holists who think they can't.[17] And then there is perhaps the biggest debate of all, between materialists who think social life ultimately can be explained by material conditions and idealists (or idea-ists) who think that ideas play an autonomous or even decisive role. This latter debate arguably subsumes the other two, since without ideas in play there would be no meanings to interpret or social structures to reduce. Moreover, this debate is not merely like the mind–body problem in seeming intractable, but of a piece with it substantively, because ideas are dependent on consciousness. Which is to say: some of the deepest philosophical controversies in the social sciences are just local manifestations of the mind–body problem. So if the theory of quantum consciousness can solve that problem then it may solve fundamental problems of social science as well.

I have put a lot of balls in the air and will not try to catch them all. First, except in Chapter 8, I will not deal extensively with quantum decision theory. Work in this vein is in full swing, and now spreading from psychology to the social sciences at large,[18] and with no formal training myself, I am in no position to contribute to it. My focus instead will be on its philosophical implications, which have been neglected so far. Second, only in the Conclusion will I take up the Explanation–Understanding debate. One reason is frankly practical; this book is so long already that to finish it I need to focus its argument as much as possible. Another is that pioneering contributions in this area have already been made by scholars such as Karen Barad, Michel Bitbol, Patrick Heelan, and Arkady Plotnitsky – although they are by no means all in agreement.[19] But most importantly, in my view we will not make clear progress on the epistemology of a quantum social science until we have a firm basis in its ontology, where little work has been done. That leaves just one – albeit still very large – ball to catch, the nature of ideas and consciousness, and its implications for the agent–structure problem.

[15] I will use these terms interchangeably, giving 'positivism' a broader meaning than it carries in much social scientific discourse, where it is often juxtaposed to scientific or critical realism. Realists are naturalists and thus positivists in my sense.
[16] See Apel (1984) and Hollis and Smith (1990) for introductions to this debate.
[17] See for example Wendt (1987), and Wight (2006) and Elder-Vass (2010a) for the state of the agent–structure art in IR and social theory respectively.
[18] See, for example, Haven and Khrennikov (2013) and Khrennikova et al. (2014).
[19] See Barad (2007), Bitbol (2002; 2011), Heelan (1995; 2009), and Plotnitsky (1994; 2010).

Since the start-up costs for thinking in quantum terms are high, my goal in this "preface" is motivational: to explain why it is necessary to turn to such an exotic theory to solve basic problems of social ontology. In particular, I show that the agent–structure problem stems from the fact that the ways in which social scientists have dealt with an essential feature of the human experience – namely experience itself – originate in classical assumptions about the mind–body problem. The chapter ends with an overview of the book's positive argument.

## The causal closure of physics

There are at least two long-standing anomalies in social ontology: the existence of subjectivity, specifically its conscious aspect; and the unobservability of social structures. The two are related through the agent–structure problem, of which they are in effect opposite sides, and in the end I argue that the second is a function of the first. However, they involve distinct issues and literatures, and as such are treated separately below.

In social theory, subjectivity and unobservable social structures are usually referred to as "problems" rather than "anomalies," but this understates their significance. By calling them anomalies I mean that, given a classical worldview, they simply should not be there any more than the anomalies in physics which sparked the quantum revolution should have been there. To be sure, subjectivity and social structures cannot be seen with the naked eye or recorded on instruments, and as we will see this has prompted some philosophers to argue that they are illusions and thus *aren't* there. However, most social scientists, I suspect, think they are, so before we give in to philosophers of illusion it makes sense to explore all possible means to justify this belief.

But first, I need to do some work on the other side to convince credulous social scientists that subjectivity and social structures are anomalies at all. To do that, in this section I begin with a foundational principle to which all social scientists should agree, the "causal closure [or completeness] of physics" or "CCP."[20]

The CCP means that the social (and all other) sciences are subject to a physics constraint: no entities, relationships, or processes posited in their inquiries should be inconsistent with the laws of physics. The idea is that because physics deals with the elementary constituents of reality, of which macroscopic phenomena are composed, everything in nature[21] is ultimately just physics. This

[20] With apologies to the Chinese Communist Party; for good introductions to the CCP and its rationale, see Papineau (2001) and Vicente (2006; 2011).

[21] Or at least everything with causal powers in the temporal world; the CCP does not rule out the existence of God or other spiritual phenomena as long as they mind their own business; see Papineau (2001).

gives physics a foundational role with respect to other sciences, which today are often collectively called the "special" sciences to signify their subordinate status.[22]

At a working level the CCP is almost universally accepted today in the physical and biological sciences. The situation may seem less clear in the social sciences, where even positivists may be skeptical of "social physics," and interpretivists reject naturalistic approaches to social inquiry altogether. Nevertheless, I argue in a moment that the CCP is almost universally accepted in the social sciences as well. But before defending that perhaps provocative claim let me prepare the ground by first emphasizing two things that the CCP does *not* commit us to.

First, epistemologically speaking, the causal closure of physics does not mean social scientific theories must be *reducible* to physics, in the sense of being able to replace their laws with laws of physics without loss of explanatory content. Such reductions have proven elusive even in the physical and biological sciences, the objects of which are often closer to physics in scale and complexity than human beings are. If chemistry is not reducible to physics, then all the more reason to think that social science is not either. Our knowledge of the world is "dappled," in Nancy Cartwright's suggestive image, disparate and fragmented rather than integrated and uniform.[23]

However, as Lawrence Sklar has argued in response to Cartwright, we should not confuse the epistemological point that our knowledge is currently fragmented with the ontological point that the laws of physics *do not apply* to everything in the world.[24] All objects and forces are made up of the phenomena described by fundamental physics,[25] and thus "the laws of the fundamental theory are *as true* of these objects as they are of the carefully isolated systems of small numbers of particles constructed in the laboratory."[26] In other words, whatever law-like processes exist in social life, they cannot force the elementary constituents of nature to violate *their* laws. So while the CCP does not imply reductionism, it does limit ontologically what can exist and happen at the macro-level.

The other thing that the CCP does not commit us to is the philosophical doctrine of *physicalism*,[27] according to which everything in the world is ultimately physical. That may sound counter-intuitive, since 'physical' is usually defined by "whatever physics says there is," so how could the causal closure of

[22] See Fodor (1974). [23] Cartwright (1999); also see Dupré (1993) and Ziman (2003).
[24] Sklar (2003); also see Pettit (1993b) and Hoefer (2003).
[25] Today taken to be quantum field theory.
[26] See Sklar (2003: 433), emphasis in the original; also see Ladyman (2008: 745–746), "[s]pecial science hypotheses that conflict with fundamental physics . . . should be rejected for that reason alone."
[27] At least as it is currently understood; see below.

*physics* not imply physical*ism*? And indeed the two are often conflated in the literature.[28] In my view this conflation is a mistake, and since this will form a crucial wedge in my argument it is important to see why.

Physicalism is the modern descendant of classical materialism. Materialists held that reality is ultimately purely material, understood as the little bits of matter and (later) energy described by classical physics. Importantly, these bits of matter were assumed to lack any trace of consciousness within them. With this claim materialists opposed not just theism, which gave God a temporal role, but also all doctrines that gave consciousness or mind a fundamental status, like idealism, dualism, and panpsychism. For materialists, at the end of the day everything is just mindless matter in motion. However, with the quantum revolution materialists were betrayed by their physicist allies, who found that the classical idea of matter broke down at the sub-atomic level. In effect, quantum physics falsified classical materialism.[29] Rather than abandon materialism, however, materialists morphed into physicalists. In doing so they retained their opposition to theism and all doctrines that give mind a fundamental status, but now deferred to the ongoing inquiry of physics to tell us what precisely the fundamental level looks like.

The problem with this is not only that physicalism lacks a stable meaning of 'physical,' which has worried some physicalists themselves.[30] The problem, as Barbara Montero points out,[31] is that unlike classical physics, quantum physics does not rule out the possibility that mind *is* an elementary feature of reality (see Chapter 4). So in the quantum world, 'physical' does not necessarily mean 'material,' and as such, physical*ism* (or more precisely "*physics*-calism") does not entail and might even end up contradicting materialism. Conflating physicalism with the CCP begs the question against non-materialist "physicalisms," in other words, making it non-falsifiable and thereby trivially true.

Faced with this ambiguity we have two options. One is to go with the open-ended definition of 'physicalism' implied by deference to physics, and give up any inherent connection to old-fashioned materialism. That would be in the spirit of the discursive change to 'physicalism,' and of my own argument below, which is physicalist in this broad sense. However, it would be against how physicalism is usually understood today (i.e. as twenty-first-century materialism) and thus potentially confusing. Instead I shall follow Montero and others who argue that physicalism should be defined separately from the CCP as the doctrine of "No Fundamental Mentality," which a future physics might

[28] See, for example, Kim (1998: 147), Papineau (2001), and Vicente (2006: 168, note 5).
[29] See Montero (2001: 63; 2009).
[30] A problem known as "Hempel's Dilemma," for a good discussion of which see Crook and Gillett (2001); see Poland (1994) for a comprehensive introduction to physicalism.
[31] Montero (1999; 2001; 2009); also see Crane and Mellor (1990) and Davies (2014).

*or might not* confirm.[32] That preserves the historical continuity of 'materialism' with 'physicalism,' and also makes clearer what I am arguing against. Unless otherwise noted, I will use the two terms interchangeably below.

So accepting the CCP commits us neither to reductionism nor to a materialist physicalism – all we have to accept is that everything that exists and occurs in nature, including social life, is constrained by the laws of physics. It seems hard to disagree with that, since consider the alternative: things happen to which the laws of physics do not apply. But in that case, what – or *where* – are their extra-physical causes? One possibility is God, though in that case we are in the realm of faith and engaged in an altogether different enterprise. The other main historical answer was Descartes' substance dualism, according to which mind is its own reality entirely separate from matter, but still part of nature. But substance dualism is no longer widely seen as credible,[33] and it seems a second-best solution in any case, to be embraced only if a comprehensive physicalism (now in the broad sense) proves impossible to articulate. Since I do not think that this has yet been proven, insofar as we are committed to social *science*, I take it that the laws of physics constitute a basic constraint on what social objects can be and do.

I cannot think of any social scientist who does not accept the CCP. For positivists it is constitutive of the very idea of science, so this case is clear. However, it might not seem so for interpretivists. Interpretivists explicitly reject naturalistic approaches to social science on the grounds that intentional phenomena – mental states such as beliefs, desires, and meanings – play a central role in human life, and do not seem to be anything like physical objects or causes. Thus, if we want to capture the specificity of social life – what makes it essentially different than geology or chemistry – then looking to physics will at least be no help, and might positively hinder our understanding.

Still, I know of no interpretivist, post-modernist, or other critic of naturalistic social science who says that social phenomena can *violate* the laws of physics. To be sure, the people interpretivists study might believe in things that violate the laws of physics, like a God with powers to intervene in the physical world, and on that basis create institutions that have real effects. However, whatever their personal views about God, in their scholarship interpretivists would not

[32] See Montero (2003), Wilson (2006), Brown and Ladyman (2009), and Göcke (2009); for skepticism about the No Fundamental Mentality constraint on physicalism see Judisch (2008) and Dorsey (2011).

[33] Though see Göcke, ed. (2012) and Swinburne (2013) for recent exceptions, and Stapp (2005) and Barrett (2006) for arguments that dualism is implied by quantum mechanics. The skepticism toward substance dualism does not extend to *property* dualism, according to which complex forms of matter can give rise to irreducible mentality; see for example Koons and Bealer, eds. (2010).