Book Review

Significant for What It Is and What It Is Not: A Review of *Quantum Mind and Social Science* by Alexander Wendt

Wendt, Alexander. 2015. Quantum Mind and Social Science: *Unifying Physical and Social Ontology.* Cambridge: Cambridge University Press, 354 pp, £ 25.99.

Alexander Wendt is a professor of International Security at Ohio State University and the author of *Quantum Mind and Social Science*. The book's premise is that mental processes, such as free will, consciousness and intentionality, are incompatible with the deterministic account of the universe posited by classical physics. This poses a serious problem to social sciences since it depends, in many aspects, on these concepts being real and not mere "as ifs."[1] Luckily, classical physics has not been our best account of physical reality since it was dethroned in the early 20th century by Quantum Mechanics (QM). With clarity, and not a small amount of urgency, the book paints the need to understand and explain mental phenomena central to social sciences and the human condition. To do that, Wendt uses QM, in all its might and mystery, to explain everything from free will to consciousness, and provides a unified ontology of both the physical and the mental. The reader unfamiliar with QM should not be worried. Wendt delivers one of the better introductions to the history and interpretations of QM and requires no previous knowledge of QM or physics. Finally, the book is exceptionally well researched. It is perhaps the most comprehensive collection of references to papers and books about QM and social sciences, a small but fast-growing field of cross-disciplinary studies.

Despite the positives, this book is experiencing hurdles in being accepted as *the way* to unify natural and social ontologies. More than a century after the birth of QM there is still no agreement as to which interpretation is more likely to be correct. The number of theories interpreting the quantum realm is growing, and just like social theories, they "rarely die, and if they do, like zombies, they inevitably come back to life later."[2] The book's central argument rests on a specific set of QM interpretations known as the Consciousness Collapse Theories (CCT) – theories that give the observer a causal role. As such, CCTs belong to a niche and are out of favor with most people within the theoretical physics community. The situation is similar with the theories of mind and consciousness. There are perhaps fewer candidates, but no single theory dominates the field. Wendt's pick – the Quantum Brain Theory (QBT) – is a highly contested theory by the philosophers of mind

1 Wendt 2015, 1–38.

2 *Ibid.*, 2.

and neuroscientists alike, but fits neatly with the rest of the book. Nevertheless, the book is a seminal work in depth and breadth and is stirring up the conversation. Whether or not it turns out to be correct, it still deserves to be widely read.

The Argument

For Wendt, consciousness is the anomaly that lies at the heart of social science constrained by the laws of classical physics. Wendt writes that "the laws of physics constitute a basic constraint on what social objects can be and do" and therefore, "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."[3] He calls this principle the Causal Closure (or Completeness) of Physics.[4] Wendt is adamant about Causal Closure of Physics being true and widely accepted by social scientists. The problem, however, is that the type of physics that social science abides by is classical. Wendt postulates that mental phenomena, like consciousness, free will, intentionality, beliefs, desires, and meaning, are inconsistent with the determinism presupposed by the classical physical theories. "In sum," writes Wendt, "there is tension between social scientists' commitment to materialistic, classical physics constraints on their work and routine use of intentional states to explain human action" and adds that "if we approach social science under a classical physics constraint, then intentional phenomena have no place in our work."[5] Wendt develops his position further in three steps: a) he defines the mind-body problem as the problem of consciousness, b) he frames consciousness as the anomaly for the classical worldview, and finally he proposes, rather forcefully, that c) "if consciousness cannot be reconciled with the classical world view, then intentional phenomena no more belong in a classically conceived social science than vitalism's élan vital belongs in a classical biology."[6] Wendt then proceeds to place the problem of consciousness at the heart of other philosophical debates, such as the agent-structure problem, the ontological definition of the state, and so forth, and through the lens of QM, explains each one.

The QM concepts employed in the book are many but the following three are central to its argument: the wave function, the wave function collapse and the entanglement. *The wave function*, as defined by Ervin Schrödinger and enshrined in Schrödinger's equation, describes the state of an isolated quantum system (e.g., an isolated subatomic particle such as an electron) and how that system evolves in space. The equation describes a system that evolves deterministically, but the results it gives us are probabilities of finding the system in any given region of space. *The wave function collapse* happens when the same quantum system interacts with another object, stops acting as a wave, and exerts particle-like behavior. QM tells us that particles behave both as waves and point particles.

3 Wendt 2015, 7.

4 *Ibid.*

5 *Ibid.,14.*

6 *Ibid.*

Wave function collapse leads to point-particle behavior and is why we experience the world around us as we do, composed of solid objects with definite locations in space and not shimmering waves. And finally, the concept of entanglement. Two particles are said to be entangled when they share a quantum state so that the measurement of one particle "influences" the results we get if we were to measure the other particle. The phenomenon is experimentally confirmed beyond doubt, and the concept holds even if the two particles are lightyears apart.

The dominant interpretation of what it all means is known as the Copenhagen Interpretation (CI) and was put forward by one of the fathers of QM, Neils Bohr. In spite of the fact that Bohr and his disciples invented most of QM's mathematics, they believed that the reality at the quantum level is unknowable, that the very question of what is *really* going on there is meaningless, and that physicists are better off focusing on predicting quantum behaviors. However, to stand as a coherent physical theory, even if so profoundly anti-realist in nature, CI had to somehow explain the emergence of the large, macroscopic, classical world. Bohr and his followers all agreed that, even though we can't know what the wave function truly is, the wave function described by the Schrödinger's equation is indeed the best and most accurate description of the quantum system.[7] But for the macroscopic world to emerge, it had to interact with other macroscopic[8] systems as a point-particle. In other words, the wave function must collapse, which brings us to perhaps the most radical aspect of this interpretation – the observer's role in the collapse of a wave function. According to Bohr, it is the very act of observing the particle that causes its wave function to collapse. Only when we "look" at the particle to measure one of its properties do we actually find those properties. Unobserved particles have no definite characteristics, and neither does the reality around us. The unobserved reality, the interpretation claims, exists only as a cloud of probabilities and collapses into what we intuitively know as reality only upon observation, also referred to as the act of measurement.

Wendt insists that, as we strive to make social sciences compatible with our best account of physical reality, we should leave the classical world view behind and embrace the strange but accurate description of QM, including the role of the conscious observer as the active, integral part of the interpretation. Several interpretations, including the CI described above, give some role to the conscious observer. However, the only one that entirely fits the book is the Von Neumann–Wigner interpretation.[9] For Von Neumann, a conscious observer is necessary for the completion of the measurement process and the collapse of the wave function from which reality emerges. If there is no observer to perform observation, there cannot be any act measurement, and therefore, no wave function collapses into observable reality. Resting on Von Neumann's arguments, Wendt proposes the following: a human brain is a quantum object, and cognition is the wave function, describing the probabilities

7 Making the Copenhagen Interpretation an epistemic, rather than an ontic theory.

8 Two subatomic particles can interact without their respective wave functions collapsing, as it is in the case of entanglement.

9 Von Neumann *et al.* 1955.

of yet to be realized futures. A person's intentions are, in effect, one's yet to be realized futures, and by the power of free will, one performs the act measurement, choosing one of many possible futures and effectively collapses the wave function of the brain into one's experience. Or, as Wendt himself would put it: "With the wave function as Cognition and its collapse as Experience, Will would then be the force that brings collapse about."[10]

Wendt believes that this allows us to save from elimination all mental phenomena that explain so much in social sciences and which subjective nature is fundamental to our understanding of ethics and moral responsibility. The bridge between interpretations of QM and Wendt's new social ontology is through an approach colloquially called the Quantum Brain Theory (QBT). The underlying idea comes from Roger Penrose and Stuart Hameroff as a pioneering theory that considers a brain to be a quantum computer[11]. According to the theory, it is quantum fluctuations in neuronal microtubules and not the neurons themselves, which are the source of consciousness. QBT lends itself well as a bridge between QM and Wendt's other conclusion, the ontology of panpsychism. Panpsychism, in simplest terms, claims that everything is conscious, including subatomic particles. More specifically, the panpsychism that Wendt employs in the book treats reality as if it was made out of stuff that is neither mental nor material but able to be both, the view also known as *neutral monism*. While working out the intricacies of connecting QM, the quantum brain theory, and panpsychism into a coherent whole would take a bite out of most, for Wendt, it is just a warm-up. In the rest of the book, he tackles many other concepts, such as the state as a "holographic organism endowed with collective consciousness,"[12] free will, experience, perception, language and even the nature of life through vitalism.[13] Wendt's deep philosophical understanding of each subject is woven well with the relevant works in QM, leaving the writing clear and concise.

The Critique

To understand why the book draws at least as much criticism as it does praise, one needs to consider Wendt's reliance on consciousness as central to interpreting QM. The debate around which interpretation of QM is correct is far from over and, as previously discussed in this article, only some of the interpretations require a conscious observer, and only one, the Von Neumann–Wigner interpretation, has the features necessary for the rest of Wendt's arguments to hold. The still dominant CI gives the observer a causal role, and as such, it could prop up the rest of the book if it were not, at the same time, anti-realistic and epistemic. For materialists and realists such as Albert Einstein, such radical anti-materialist and anti-realist ideas were hard to accept. Einstein's interpretation of QM's formalism was in stark contrast to Bohr's. Einstein, together with Louis de Broglie and

10 Wendt 2015, 121.

11 Hameroff and Penrose 1996.

12 Wendt 2015, 34.

13 *Ibid.*, 131.

David Bohm, believed in an objective reality that evolves deterministically according to the laws of nature. According to this camp, both the wave function and the point-particle are objective but separate features of the universe. The wave function, or the pilot wave, as Bohm called it, is what gives the quantum system a wave-like property but only as a guide (or a pilot) for the actual point-particle. Therefore, according to this camp, QM, in its current form, albeit our best, is not the complete description of the universe. Another interpretation that has been rising in popularity is the Many-Worlds Interpretation (MWI). In 1955, a physics graduate at Princeton, Hughe Everett, put forward an audacious proposal of a universal wave function and a universe that splits itself into branches every time an act of measurement is performed. Contrary to what the name might suggest, MWI is an elegant and lean theory. It states that all there is to the universe is the wave function as described by Schrödinger's equation. It evolves deterministically, and it is our knowledge of the system that is stochastic. In the 1970s, as the atomic age entered a mature stage, physicists started going back to the foundation of physics, and new interpretations emerged, including Objective Collapse Theories. A more prominent interpretation within the set is the Ghirardi–Rimini–Weber theory, postulating a stochastic universe in which the wave function of a quantum system spontaneously collapses to form macroscopic reality. No interpretation in this group gives the observer any role at all. Even Sir Roger Penrose, on whose QBT Wendt relies heavily on in the book, belongs to the Objective Collapse Theories camp. And the list goes on. In his paper, appropriately titled "Interpretations of quantum theory: A map of madness," Adan Cabello lists some 16 distinct interpretations,[14] most of them well rounded scientific theories. All follow the same mathematics but tell a different story about the world (see Table 1 for the easier comparison of the theories mentioned above).

Interpretation	**Deterministic or Stochastic**	**Wave Function**	**Wave Function Collapse**	**Conscious Observer**
Von Neumann–Wigner Interpretation	Stochastic	Ontic	Yes	Causal Role
Copenhagen Interpretation	Stochastic	Epistemic	Yes	Causal Role
Objective Collapse Theories	Stochastic	Ontic	Yes	No Role
The Hidden-Variable Theories	Deterministic	Ontic	Yes	No Role
Many-Worlds Interpretation	Deterministic	Ontic	No	No Role

Table 1: *Popular Interpretations of QM*

That only one out of many interpretations "fits the bill" does not necessarily mean that the author is wrong. But even a century later, the physics community is as far from a coherent worldview as it was in the time of Einstein and Bohr. What causes the wave function to collapse is a point of major disagreement amongst physicists and the jury is still out there

14 Cabello 2017.

if the collapse happens at all. In 2011, Schlosshauer, Kofler, and Zeilinger[15] conducted a poll at a physics conference, and got the following results: 42% for Copenhagen, 18% for Many Worlds, 9% for Objective Collapse, and so on.[16] Although Von Neumann–Wigner's interpretation did not appear as a choice in the poll, only 6% of the respondents said that a conscious observer plays a role which is central to this theory. Polls are not the way to settle scientific or philosophical debates, but this one illustrates a fundamental difficulty of building ontology on top of something so controversial as interpretations of QM. With the Von Neumann–Wigner Interpretation being such a niche and barely represented approach, one cannot help but wonder if the author is cherry-picking the theory to support the conclusion. In his review, Michel Torsten, an International Relations (IR) theorist from the University of Bristol, agrees: "Wendt postulates the goal and then navigates his way through competing interpretations of quantum theory, picking the path compatible with his overall argument to arrive at his destination."[17]

Wendt's use of Penrose and Hameroff's QBT draws similar criticism. QBT relies on a phenomenon proposed by Penrose called orchestrated reduction of quantum coherence – an idea that it is gravity that causes quantum states to lose the quantum mechanical properties and decohere into classical reality. Furthermore, Penrose and Hameroff postulate that the quantum computing done by microtubules inside neurons is what allows consciousness to emerge. The theory is bold as it attempts to reconcile gravity with QM, the holy grail of physics. It sits in stark contrast to other consciousness theories, most of which assume that consciousness emerges from the interaction between neurons. Also, in addition to lacking any empirical evidence, QBT lacks support among physicists, philosophers, and neuroscientists alike. At this point in the book, Wendt explicitly asks the reader to consider "whether assuming it [QBT] to be true might help us solve the mind-body problem." For if it is not, according to the author, "we are back to square one on explaining consciousness."[18] Similar statements throughout the book render a harsh judgment on the achievements of the philosophy of mind and neuroscience thus far. The judgment is harsh in part because modern neuroscience is a young discipline. We have been able to safely and reliably peek inside a working human brain for only a few decades. Again, Wendt is correct to note how far we are from a coherent theory of consciousness, but precisely because of it, picking QBT as *the theory* and making it a linchpin in the chain of argument seems like another case of cherry-picking.

15 Schlosshauer, Kofler, and Zeilinger 2013.

16 In 1997, Max Tegmark, a physics professor at the Massachusetts Institute of Technology, got similar results. Most favored CI, Many Worlds came second.

17 Torsten 2018.

18 Wendt 2015,107.

The Conclusion

It is challenging to consider what direct implication the book will have on IR, Wendt's primary field of study. In IR, as in other social sciences, mental processes are already widely used to describe, explain and predict the behaviors of both individuals and social groups. As Patrick Jackson of American University asked in his review: "So what is the value of quantum vitalism, if the social theory it generates can be reached in other ways, and perhaps already has been reached in those other ways? Why do we need a physical basis for consciousness in order to get on with the business of providing theories about social life?"[19] At the start of the book, Wendt mentions that specific work on QM and IR is underway. A glimpse of that work may be found in his 2020 paper,[20] published in the special edition of *Security Dialogue*, together with James Der Derian from the University of Sydney. The main contribution of "quantized IR," the authors predict, will be in understanding the emerging quantum technologies, such as quantum cryptography, quantum computers and quantum communications. That makes sense but hardly requires a reinvention of social ontology or a grand marriage between natural and social sciences. At the beginning of the paper, the authors seem to agree: "We have chosen a less than-grand strategy, which is to follow the developmental path of quantum mechanics itself, seeking to reintroduce quantum ideas incrementally to the social sciences through a series of conferences, workshops and published papers in a manner similar to the *Gedankenexperiments* or thought experiments of the 1920s."[21] This stands in contrast with the book's bolder aim. Perhaps, after all, the *Quantum Mind and Social Sciences*, with panpsychism, vitalism, and time traveling, is to be read more as an "as if" rather than the "as is" account of reality.

None of the criticism diminishes the importance or the quality of thought put forward in the book, a book that took a decade to write and that contains every bit of what has made Wendt one of the most read and respected social scientists today. Yes, it is audacious, controversial work that at times seems incomplete but Wendt is well aware of this and in the conclusion acknowledges all the things he did not do in the book, including testing "theories against empirical evidence."[22] Above all, the book is inviting social theorists and physicists to share a table and both sides should heed the call.

19 Jackson 2016.

20 Der Derian and Wendt 2020.

21 *Ibid.*, 2.

22 Wendt 2015, 284.

References

Cabello, Adán. 2017. "Interpretations of quantum theory: A map of madness." In *What is Quantum Information?* edited by Olimpia Lombardi, Sebastian Fortin, Federico Holik, and Cristian López, 138–143. Cambridge: Cambridge University Press.

Der Derian, James, and Alexander Wendt. 2020. "'Quantizing International Relations': The Case for Quantum Approaches to International Theory and Security Practice." *Security Dialogue*, February 2020.

Stuart Hameroff, Roger Penrose. 1996. "Orchestrated reduction of quantum coherence in brain microtubules: A model for consciousness." *Mathematics and Computers in Simulation* 40 (3–4): 453–480.

Jackson, Patrick Thaddeus. 2016. "Fundamental Grounding." *Perspectives on Politics* 14 (4): 1153–1157.

Schlosshauer, Maximilian, Johannes Kofler, and Anton Zeilinger. 2013. "A Snapshot of Foundational Attitudes Toward Quantum Mechanics." *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 44 (3): 222–230.

Torsten, Michel. 2018. "Of Particles and Humans: The Question of 'Human Being' in Alexander Wendt's Quantum Mind and Social Science." *Millennium* 47 (1): 114–127.

Von Neumann, John *et al*. 1955. *Mathematical Foundations of Quantum Mechanics*. Princeton: Princeton University Press.

Wendt, Alexander. 2015. *Quantum Mind and Social Science: Unifying Physical and Social Ontology*. Cambridge: Cambridge University Press.

Aleksandar Sasha Mircov is an independent researcher. E-mail: sasha.mircov@gmail.com.