

Longer version of review of Sabine Hossenfelder's *Existential Physics* (TLS, July 14, 2023)¹

As a working scientist, 'doing philosophy' is not part of the job description. Physics is the collective effort of a whole community building and testing theories, accumulating a storehouse of precise and carefully collected data, building on generations of research. General philosophical beliefs about the world – e.g., *that matter is made of a small stock of fundamental building blocks, that light is a wave, that space and time are dimensions in an indefinitely extendable manifold of events* – make only attenuated contact with experience and get their support in their success in organizing the whole body of phenomena, and physics doesn't care about the human being more than it cares about the dust on a shelf or debris that floats through the Milky Way. The individual scientist's job is not to build her own worldview and not to reflect on human problems, but to calculate, to experiment, to apply theory to understand phenomena. Science looks most like philosophy at times when accepted theories are failing and there is confusion about fundamental principles. To most physicists, these are unhealthy periods. There is a prevailing distaste for, and discouragement of, philosophizing.

Nevertheless, the field as a whole is building a worldview and a totalizing one that offers a vision of the universe and our place in it. There is a tradition of physicists writing popular books that reflect philosophically on what physics can teach us about the human condition. This book is a contribution to the genre. Hossenfelder is a physicist who works on quantum gravity, with a blog that made her known as a gadfly in her field. A previous book took on one of the sacred cows of theoretical physics – the pursuit of beauty in theorizing – and in this book she says that she is going to bring established science to bear on the kinds of questions that ordinary people ask: "people don't care much whether quantum mechanics is predictable, they want to know whether their own behavior is predictable; ... They don't care much whether galactic filaments resemble neuronal networks; they want to know whether the universe can think". More ambitiously, she is going to convey what physics tell us about the human condition. What are we? (Are you just a bag of atoms?) Has physics ruled out free will? The book, she says "is for those who have not forgotten to ask the big questions." She isn't going to talk about the speculative parts of science, for the most part. She says that she is just going to report what established science says about the kinds of questions that appeal to non-professional curiosity. Brilliant! an inspired idea for a book.

The early parts of the book which address issues raised by modern physics. There are chapters on things like what distinguishes the present from the past and future? How did the universe begin and how will it end? There are discussions of fine-tuning, the direction of time, the multiverse of quantum mechanics: all familiar fare to people that have a laymen's interest in physics.

She gives deft explanations of sometimes complex ideas with no formalism. There is an analogy of a mixing bowl in her discussion of thermodynamics, for example, that is simply wonderful and should become standard. Throughout the book, there is a running dialogue with the reader. She tells the story that science tells us about some matter (e.g., how the universe will end). and then raises then raises the raises the question (e.g., p. 74) "Now let us talk about how much of this we actually know and how much is speculation."). She writes casually, and at times amusingly, with no hint of condescension to the reader and is often withering in her criticism of experts. On whether we should trust physicists' predictions for the end of the universe, for example, she says "You might as well ask a fruit fly for a weather forecast." (p. 60)

Questions about how much we really know and how much we can possibly know are a continuing theme. Hossenfelder is critical of ideas that she regards as *ascientific*, a category she glosses as unobservable and not necessary to explain what we can observe. Alongside religious beliefs, these include the many worlds of quantum mechanics and the pansychist suggestion that even electrons have some degree of consciousness. It would have been nice to find a clearer statement of what she has in mind here. Physics give explanations that involve postulating all kinds of things that are not observable to the naked eye. If observable means 'can be discriminated by the naked eye' and 'necessary' means 'no other possible explanations exist' the criterion would rule out everything from electrons to the mouths of dust mites (dust mites, we can see; their mouths require a microscope). If the category of observable is widened to include what can be observed with scientific instruments and 'necessary to explain what we observe' is weakened to mean 'invoked in an

¹ <https://www.the-tls.co.uk/articles/existential-physics-sabine-hossenfelder-book-review-jenann-t-ismael/>

explanation of phenomena', it seems auras and ghosts and even indeed the many worlds of quantum mechanics would pass the test. I expect this line is softer than she lets on.

When discussing the kinds of philosophical puzzles raised by modern physics, the book is informative and engaging, without making strong demands on the reader. Chapters interspersed with interviews (physicists Tim Palmer, David Deutsch, Roger Penrose, and science writer Zeeya Merali) that are too brief to be more than a distraction. When discussing what can physics tell us about the deep and enduring problems of philosophy, it falls off the rails.

There is no firm definition of what makes a problem philosophical. Philosophy focuses on conceptual problems that don't yield to calculation and experiment. The best problems are the ones that present themselves as a dilemma; where there are NO easy answers, where millennia of reflection have hardened them into intractable choices between uncomfortable positions. Deep ones aren't artefacts of any particular choice of fundamental concepts but reveal tensions inherent in any attempt to understand the world. Consider for example, the age-old debate about the relationship between mind and matter. This is a problem that is confronted by any totalizing vision of the world; and it has come into particularly sharp focus in recent years as our understanding of the brain has matured. Physics, together with rise of modern neuroscience, gives us a very explicit and detailed understanding of matter and permits an almost surgical separation of the kinds of questions about the mind that could be incorporated in a purely materialistic understanding of the universe and those that seem beyond its reach. David Chalmers dubbed problems in the first class 'Easy' and those in the second, the 'Hard'. Easy problems include understanding perception, cognition, decision, learning and processing of information. All of these are processes that can be understood functionally in terms their role in explaining behavior; and there is no principled obstacle to understanding how physical processes in the brain could support these kinds of behavior. figuring out what those processes are and how they do so is everyday work for science. The 'hard' problem is understanding why these processes are conscious. Why aren't we just robots or zombies: the biological equivalent of self-driving cars without any inner universe? why do we have experience, why is there is something it is like from the inside for us to be perceiving, thinking, or learning?

This distinction between Easy and Hard problems is now standard in the scientific and philosophical discussion of consciousness, and Hossenfelder seems completely unaware of it. She equates consciousness with thinking (p., 184), and says that dualism is 'the belief that the human brain is exempt for the laws of nature" (p. 82). None of this is right. Dualism in the form that is most often discussed these days and is at issue in the discussions she refers to, is the belief that although consciousness might be *caused by* processes in the brain, or connected by them by special psychophysical laws, it is not reducible to them; it is something over and above those processes. It is a position that very explicitly recognizes that the brain is a natural object that obeys the laws of physics. Her whole discussion simply misses the mark. It is adjacent to where the real problem lies.

This is a symptom of what plagues the book as a whole, which is that Hossenfelder doesn't seem to appreciate the careful and complex articulation of positions that goes into refining a philosophical question. Sliding over the surface this way simply doesn't work here. The big questions are big because they are harder than Hossenfelder seems willing to recognize.

Hossenfelder has been vocal (on her blog, social media and papers posted on archives) about having very strong views about the compatibility of human free will. It is not a concept with an uncontested definition. Most of us have some implicit grasp of what it means to be free and feel some shock when the puzzle is presented to us, but an implicit grasp is not a definition and this is the starting of a philosophical conversation about what it means to be free. One of the ways of getting traction on the debate so that it doesn't simply turn into a war of definitions, is to connect free will to moral responsibility. Freedom is whatever makes it right to hold someone morally responsible for their actions, so if we can shift the debate and ask what it takes for someone to be morally responsible, and whether moral responsibility is compatible with determinism. Hossenfelder thinks moral responsibility doesn't require freedom. She writes (p. 138): "we evaluate which actions are most likely to improve our lives in the future. And when it comes to that question, who cares whether philosophers have yet found a good way to define responsibility? If you are a problem other people will take steps to solve that problem – they will 'make you responsible" just because you embody a threat."

I'm puzzled by the argument here. The question that the notion of responsibility is supposed to adjudicate is when it is right to take steps to solve a problem that other people's freedom poses to you. The issue is not what 'people *will* do', but what we *ought* to do. When is it morally right, for example, to put someone in prison, to limit their freedom. Who cares? Lawyers, judges, ordinary everyday people who want to make sure that when they license the state to punish

someone – e.g., to put them in jail, to put them to death - it isn't *just* because they posed a problem for us/embodied a threat to our own desires. You and I make a distinction between a puppy that accidentally knocks over a table that injures a bystander and someone that willfully and maliciously commits a murder. These distinctions aren't just philosopher's fetish; they are distinctions that we all make. The problem of free will is (in part) whether their legitimacy is threatened by determinism.

There are many places where philosophers will throw up their hands and say "what is she even talking about?". She writes "a lot of people think it is a merely a philosophical stance that the behavior of a composite object is determined by the behavior of its constituents ... they call it reductionism, or materialism, or, sometimes, physicalism." Again, wrong. The belief that bigger things are made of smaller things and that the behavior of composite objects is determined by the behavior of their components, i.e., reductionism, is not the same as physicalism or materialism. Those are wholly different things. Physicalism or materialism deny that there are non-material things. They are opposed to those who believe that consciousness is not a physical phenomenon, or that each of us possesses an immaterial soul. I can be a reductionist without being a materialist (if I think that souls are constituents of people and play a role in determining action) and a materialist without being a reductionist (if I believe in emergence of a strong kind). Holism, as the term is used by the most persuasive and important defenders of holism is not the view that, as she says, there are objects whose behavior is in conflict with the physics of elementary particles. I don't know any holist in philosophy that would say such a thing. The most interesting and sophisticated holists are pointing to things like biological phenomena where certain kinds of decomposing explanations don't work because of complex coupled interactions among parts, or quantum mechanics where one can't recover correlations from the intrinsic dynamics of components without non-local interactions. So when she writes "if you say "holism", I hear "bullshit", that is an honest confession that she is not hearing what those people are saying. (p. 83) Nor is ontological reductionism the view that "We get better and better explanations by physically going to smaller and smaller scales" (p. 97) Questions about what makes an explanation better are too vague, context dependent and highly contested to be part of a good definition. Ontological reductionism is the view that big things are composed of little things and that the behavior of big things is determined by the behavior of their components. That's it. I'm not quite sure what has happened here: And I wonder that her publishers did not think to have it looked at by a philosopher. A basic fact check would have corrected the comment that Descartes believed that the only thing he could be certain of was his own existence (please read past book 1 of the Meditations). It's frustrating to see such a great idea for a book so badly executed.

People often wonder what the point of philosophy is. Philosophers talk about the same problems over and over, they say. They never get anywhere, they never come up with a definite answer. But these kinds of questions – what is to be conscious? what is to free? what it is to be responsible for one's actions and how is that compatible with treating ourselves as part of nature? - are questions that occur to ordinary reflective people. In philosophy unlike in science the art is often in appreciating the deep and often irresolvable tensions that infect what it is to be a human. Focusing on the hard problems – the Big Questions, as Hossenfelder says – keeps one awake to the universe in all of its elusiveness, ambiguity and complexity. It enlarges our conception of the universe, keeps its mystery alive, and perhaps most importantly, it serves as an antidote to dogmatic assurance that we fully understand. It demands a tolerance of ambiguity, humility, a capacity for philosophical perplexity... and immense patience. It's not for everybody. It's hard not to love the bold and easy spirit with which Hossenfelder begins her book, but she is not well-suited to it.