

THEORY AND REALITY: an introduction to the philosophy of science, Peter Godfrey-Smith

The title is all caps while the subtitle is no caps – no doubt a choice by the publisher to add stylish intrigue.

A hundred years ago in the early 60's, I was an undergraduate studying physics. There were a number of philosophical issues that seemed to recur to me, like: what could the square root of -1 mean in physics as opposed to abstract mathematics, does causality apply to quantum uncertainty, and, by the way, what is causality anyway? These were never discussed in my physics classes. The weirder things got, the more fun it seemed. I learnt how to use the square root of -1 etc. and, for the most part, I answered exam questions correctly and that might suggest that I understood the subject-matter. But I knew I didn't. There were gaps in my understanding but at the time, they didn't seem to matter much. I assumed that philosophy of science addressed these issues. I assumed that philosophy of science concerned the philosophical issues that scientists encountered in their science but didn't have the time or inclination to pursue on their own. For me, the importance of those questions was secondary but neither did I forget them. And so here I am many years later during Covid 19 isolation thinking I might fill some gaps by reading an introduction to philosophy of science. I chose Godfrey-Smith's book for no particular reason – perhaps it was the mystery of the all caps/no caps title/subtitle.

It's an honest book. Godfrey-Smith makes a real effort to present the current state of his field, warts and all, and I give him full points for that. I did not expect, in an introduction, to have thorough discussions of the issues that interested me. But what surprised me is that philosophy of science does not seem at all to address the philosophical issues that scientists face in their science. So far as I can tell, philosophers of science have their own issues that only tangentially contact the issues scientists deal with. And it's my impression that that characterizes philosophy in general. Among themselves, philosophers have very animated disputes and controversies that are unknown and unimportant to normal folk, even folks working in the fields philosophers discuss. Surprising to me. Why would that be? Why would philosophy be so removed from the actual substance of the fields that philosophy addresses? It's my conjecture that philosophy of science doesn't address the questions that interested me in physics precisely because philosophers are wary of encroaching on areas already colonized by physicists, but (who knows?) maybe those questions are addressed by some philosophers --but not in Godfrey-Smith's book.

Instead of the questions that I expected, most of the book dealt with the history or the sociology or the practice of scientists, rather than the philosophical issues the scientists themselves faced. I had read Thomas Kuhn's book, *The Structure of Scientific Revolutions*, maybe thirty years ago. Just general reading – it was a famous book. I didn't realize it was considered philosophy of science. I thought it was history and sociology, interesting in its own right. I don't know enough to agree or disagree with his ideas and I'm happy just to be a lay spectator and not come to any firm conclusions of my own.

Next to the social organization of scientists doing their work, the major issue addressed in Godfrey-Smith's book is the nature of objective physical reality, an aspect of which is how one can know about objective reality. To understand the nature of physical reality seems to me the most fundamental issue in philosophy in general. Somehow, I didn't realize this issue was considered philosophy of science either. But how could it not be – it's the foundation of knowledge. That foundation is important to everyone, not just scientists or philosophers. Even if someone doesn't remember contemplating that

fundamental issue, he can't possibly have escaped it. A few years back, I read a book titled *Scientist in the Crib: What Early Learning Tells Us About The Mind* in which cognitive scientists describe the intellectual development of children. I remember thinking the book was mistitled. A better title would be *Philosopher in the Crib*. In the area of foundations, I hope I remain open-minded but I do have conclusions of my own. I'm not content to be a lay spectator passively watching the give-and-take between great athletes.

Godfrey-Smith deals with this fundamental issue by describing the history of different schools of thought. Each school is identified by an "ism" name; e.g., empiricism, logical positivism, naturalism, scientific realism... I suppose that's normal for philosophers but I wish they didn't do that. Once some ideas are identified by an ism name, the name takes on a life of its own, often quite distinct from the ideas to which it initially referred. The more an ism name is used, the mushier (the less precise) it becomes. An extreme example is "epicureanism" which nowadays connotes hedonistic over-indulgence whereas it originally connoted the opposite, temperance and responsibility. In my view, ism names exclude lay folk from philosophical discussion and lower the level of discussion among philosophers. This is especially true in this most fundamental issue where lay folk and philosophers have equal authority. I wish philosophers would just say what they mean in ordinary language which I think they could easily do. So there! Glad to get that off my chest. As Godfrey-Smith introduces a school of thought, he gives a brief description of its basic tenets and its relation to other schools. I would have liked a more thorough presentation of each school (particularly the earliest) and, since each school to some extent contradicts the others, I would have liked a real confrontation of ideas and maybe even some conclusions. But, the book was not written exclusively for me, and as an introduction to the field, apparently for undergraduates who already or will have some familiarity with each school, it's perfectly understandable. Godfrey-Smith identifies conflicts between the schools and he's very diplomatic about identifying his own preferences; all very reasonable in an introduction.

He begins with a very brief description of the "Empiricist Tradition" from the 18th and 19th centuries which he summarizes with the slogan: "...the only source of knowledge is experience". To be fair, he does not intend that slogan to be a serious examination of empiricist thought. He uses the term "fossils" by which I understand him to mean that the whole tradition is long discredited and not taken seriously by current respectable thinkers.

Here are some quotations concerning empiricism:

...a problem for empiricism has been a tendency to lapse into *skepticism*, the idea that we cannot know anything about the world.

Empiricism has often shown a surprising willingness to throw in the towel on the issue of external world skepticism.

Perhaps our concept of the world is just a concept of a patterned collection of sensations. This view is sometimes called "phenomenalism". ... I hope phenomenalism looks strange to you... It is a strange idea.

This treatment of empiricism appears on the first two pages of Chapter 2. Since Chapter 1 is entitled *Introduction*, Chapter 2 can be taken as the pre-history of Godfrey-Smith's description of the current state of philosophy of science and as such I presume it's accurate. But as a matter of substance, I think a cursory dismissal of empiricism is an error. At a minimum, I wish Godfrey-Smith had described the

arguments, pro and con, that support the slogan “...the only source of knowledge is experience” and what follows from it.

My own view is that the issues surrounding “knowledge” and “experience” are the foundations of philosophy, but far more important than that, each person necessarily debates these issues “in the crib”. The transition from infancy to mental competence is (at minimum) the successful resolution of these issues in the form of working conceptions -- intellectual foundations. Every competent adult has intimate familiarity with these foundations, even though none may have been able to articulate his conclusions with the precision that philosophy seems to require. But neither have philosophers. This suggests two things to me: (1) great thinkers do not have wisdom or authority superior to anyone else on foundational matters, and (2) the great intellectual achievements of our species, which are probably the reason for its success, suggest that precise articulation of intellectual foundations is not very important. On these foundational matters that we each first address in the crib, a layman’s view carries as much authority as anyone else’s. I don’t feel that humility requires me to be a passive spectator. So here’s my own thinking.

For a philosopher (or anybody else) to consider any topic, he has to start somewhere. Any chain of reasoning starts with initial postulates from which implications are drawn, and from them more implications, and so on. A chain of reasoning might reach a conclusion or not, but no chain of reasoning can validate its initial postulates. The choice of starting points (initial postulates) in any chain of reason is crucial. If the project is to understand the fundamental nature of physical reality, it is crucial that the initial postulates do not themselves include any hidden assumptions about physical reality; otherwise, the conclusions might only prove what was initially assumed and beg the question. So what postulates might the participants in the project agree on that do not contain any hidden assumptions about physical reality? Before answering that question, I have to make two tangential digressions. First, consider the previous sentences about reasoning and initial postulates. I think Godfrey-Smith would probably agree with them, or maybe not. But what are principles of reasoning anyway and where did I get the authority to state some of them so baldly. In my view, the character of reasoning inheres in the human intellect and to understand that character requires a philosophy of mind, not necessarily a complete description but a working philosophy that every competent individual has developed “in the crib” and will probably never articulate. Second, consider the distinction between substance and procedure. Imagine you and I are discussing what is the best language, the fact that we might be talking in English (or any other language) is a matter of procedure that serves the discussion but should not bear on the substance of the discussion which is what is the best language. The principle is that procedure should serve substance and not govern or corrupt it. If the substance of the discussion between you and me is the fundamental character of physical reality, then as a matter of civilized procedure we each acknowledge the equal physical existence and the equal reasoning capability of each other, but we have to be vigilant to prevent those procedural acknowledgements from corrupting the substance of the discussion. And so even if you acknowledge my physical existence for purposes of procedure, you must nevertheless be fully open-minded to the possibility that I do not physically exist, or to any other physical possibility. Similarly, if you are contemplating the fundamental character of physical reality, your concept of your own physical bodily existence (which you probably have) is a matter of procedure and you should try to remain fully open-minded to the possibility that you don’t have a physical embodiment. (But if you don’t have a body, then what constitutes you? – that’s a separate issue.)

The choice of initial postulates is crucial to the outcome of any chain of reasoning, but it is especially difficult to craft initial postulates when the subject is intellectual foundations. If all ideas stand on the

same foundations, how can initial postulates not contain reference to that foundation? They can't. And that introduces a difficulty but not an insurmountable one. If the reasoning occurs in a discussion between different participants, then the initial postulates are usually matters of agreement between the participants, i.e., usually postulates that the participants accept as true. But they don't have to be. Initial postulates can be assumptions, i.e., the participants can agree that the postulates will be assumptions which they agree might be true or not. The difficulty for the participants is, again, to be vigilant throughout to recognize the conjectural character of the initial assumptions and not to allow an assumption imprecisely to drift into being considered a statement of truth, or what is equally unwarranted, a statement of probable truth. If the reasoning occurs in solitary contemplation, the same principles apply.

So where to begin any discussion of "knowledge" and "experience"? I suggest the initial postulates be what might be called something like "assumptions that underlie any social undertaking". Imagine two philosophers are sitting on leather chesterfields at Jesus College, Oxford about to begin a discussion, or Bushmen are hunting for supper in the Kalahari, or most important for this discussion, scientists are doing experiments in their labs and whatever else they do in an effort to understand any aspect of physical reality. I suggest the postulates to begin the chain of reason be the assumptions made by participants in any normal social scenario at any point in history, not as descriptions that are true, but purely as assumptions that might or might not be true in any respect. That said, what is included in the assumptions underlying all normal social scenarios?

First, the participants in a social scenario recognize the physical existence of each other, i.e., they each acknowledge that each person exists in the form of a body. Each body has a common basic architecture and occupies some part of space, in which there are three dimensions of possible movement. (Of course they might not use the expression "three dimensions of freedom", but a native in the Brazilian rain forest knows as well as anybody else that he can move his arm forward and back, left and right, up and down, rotate it etc. which is fundamentally the same.) The parties also understand that the social scenario is unfolding in the present – that there was a past preceding the present scenario and there will be a future afterward. They understand that time has directionality but no degrees of freedom – they are confined to the present. You can see where this is going. Each participant in a normal social scenario begins with a basic or minimum understanding of physical reality as matter distributed in time and space. That basic minimum has only a limited range – it does not include a past going back millions of years or distances of millions of light years, e.g., the time span would be in the order of human generations and distances in the range that participants might realistically travel in a lifetime. Most of physical matter is not the bodies of the participants – most consists of inanimate matter with a variety of characteristics that any competent adult at any point in history would recognize though few could probably describe with any precision. And all would understand much of the behavior of physical matter in terms of cause and effect without the need for any explanation of causation in the abstract. This basic understanding of physical reality would be taken for granted by the participants in any normal social scenario at any point in history. I suggest we adopt the same basic minimum understanding of physical reality as an initial assumption in considering intellectual foundations, but of course, we must be vigilant to remember that that understanding, or any part of it, might be true or false and that reasoning based on it will not answer which.

Second, each participant in any social scenario understands that he has subjective mental experiences, the flow of which, for the most part, seem to follow certain principles that he probably cannot articulate and that are incomplete, and he understands that the other participants have similar types of private mental experiences that follow principles similar to his own. That understanding amounts to a basic

concept of mind. Here are some features of that basic concept of mind: (1) there are certain types of experiences, (2) each person's experiences occur somewhere within his body, (3) each person experiences his own experiences, and only his own experiences. The participants in any normal social scenario at any point in history would have familiarity with numbers of the different types of experiences, but to discuss the character of physical reality, we need primarily concern ourselves with only two types: (1) external sensory experiences, and (2) ideas. Again, the basic minimum concept of mind that would be taken for granted in any normal social scenario at any point in history would not include precise description of these mental features, but any participant would recognize them in himself and presume them in the others.

External sensory experiences are the ones we associate with "the five senses" (visual, olfactory, gustatory, auditory, tactile) plus those associated with the sense of rhythm (time) and the sense of balance (acceleration).

Ideas are more complex than external sensory experiences. Each participant in any social scenario brings to it a basic concept of physical reality and a basic concept of mind – those concepts are ideas that exist as private mental experiences of each participant. Those basic concepts are a kind of inclusive general summary of any number of other more specific and less general ideas. Ideas have the property that one idea can include other ideas. Some ideas are very simple in what they refer to, and others are very grand and include untold numbers of other ideas. The grand ideas are sometimes called "concepts" or "knowledge" but, in my view, all ideas have the same basic character. Ideas also have the property that they can be stored and then recalled from memory. Any experience can be remembered. But the experience of a memory of, say, a sight is not itself a sight; rather, it is a present idea of the previous experience of the sight. What is remembered are ideas. The basic concept of mind would not include the ability to articulate these features of ideas, but any competent adult at any point in history knows that one idea can contain others and be recalled from memory etc. Some people have exceptionally good memories but no one has complete memory of every experience. Were one person's memory complete, it might be possible to analyze the entire structure of that person's knowledge, including all the individual ideas that are included in his grand concepts of physical reality and mind, but even the most exceptional memory is grossly inadequate to the task. Even if someone's memory were complete, the task to analyze the entire intellectual structure might nevertheless be impossible because it might take more time to analyze those individual ideas than the lifetime it took to experience them.

An important feature of ideas is their connection to reason. Every idea refers to something; that is, the content of the idea is that it refers to something else. Each idea exists as a separate experience as does, say, a visual experience. The content of a sight (a visual experience) is an array of colors and intensities etc.; similarly, the content of an idea (an intellectual experience) includes what it refers to. Clearly, grand ideas refer to numerous things and it's my view that even the simplest ideas refer to more than one thing. An idea organizes more than one thing in a way that seems to make sense. The principles according to which an idea makes sense are the principles of reason or logic. The experience of every idea includes as content all the things which it organizes and the principles of the organization. The reason (the sense, the logic) of an idea is inherent in its experience -- one doesn't need to be able to articulate the principles reason or logic in the abstract: they make sense on their own as part of the experience of an idea.

What goes on in the minds of animals or do they even have minds? Some animals seem, in some respects, to be almost human. Some animals seem to understand their place in the world at birth. They

suckle immediately, or get up and run, and some immediately go about filling very specific social roles without any prior instruction or learning. This suggests that they are born with some ideas. Maybe they are born with all the ideas they will ever need and never learn new ideas. All very interesting. A question is whether humans are born with any intellectual inventory or is every idea learned. Memory is inadequate to answer that question. Even if some ideas are congenital in humans, that does not imply that those ideas are valid. Philosophers would still require some additional compelling reason to be convinced those congenital ideas are true. I bring up the possibility of congenital ideas because you can imagine a social scenario involving (primitive?) people who do regard some ideas as congenital and therefore true without more. Pretty hard to discuss an idea with someone who is certain it is true. Of course, no ideas are generally identified and accepted by philosophers as true. To the extent that memory allows, all ideas can be analyzed into their components and those into their components and so on. In my view, principles of reason are inherent but in the absence of any evidence to the contrary, I assume that all ideas are created by the person experiencing them following normal principles of reason, i.e., no ideas are congenital.

“Almost” every participant in any normal social scenario at any point in history will accept that his senses are less than perfect and sometimes seem unambiguously not to be working properly. (Maybe Donald Trump is an exception.) Similarly, I think everyone will accept that his ideas (whether through faulty reasoning or faulty memory) sometimes also seem unambiguously not to be correct. These improprieties reflect sensory and intellectual fallibility. And so an important question for everyone is how to distinguish the proper sensory and intellectual experiences from the faulty. For those ideas that purport to describe some aspect of physical reality, say a visual experience that is interpreted as the presence of someone long dead, the only way to determine whether the visual experience is accurate or the interpretation (the idea) is correct, is to take another look ... and then another and so on. The only means to validate any idea describing physical reality is more sensory experiences and ideas. Say you have one visual experience and one interpretation that it represents someone long dead and a thousand that suggest a look alike, it's easy to dismiss the anomaly but that doesn't prove the anomaly is wrong and the thousand are right. How do you know that the thousand aren't wrong and the anomaly right? If any sensory experience and any idea might be wrong, then more such experiences cannot distinguish the wrong from the right – the more might be wrong too. Dismissing anomalies is a practical approach and leads to confidence. And each person in any normal social scenario at any point in history has confidence in the minimum assumptions. That confidence is necessary and proper for normal life, but confidence is not the philosophically compelling result of rigorous reason. The experience of confidence is not the experience of a “true” idea. Confidence is an emotion – a third type of experience.

I've just included some of my own views at different points in my description of the minimum assumptions individuals bring to any normal social scenario. I hope I've kept my views separate from those minimum assumptions. But now I will describe my views of what I think must follow from those assumptions. Sensory and intellectual fallibility lead to doubt about the truth of any idea purporting to describe physical reality but, even in the absence of fallibility, the assumptions contain a much more compelling source of doubt. The minimum assumptions include a concept of mind according to which each person experiences his own private experiences and only his own experiences, one type of which is ideas. That concept leads inescapably to the conclusion that one person's ideas can refer only to his experiences and cannot refer to anything else. From his subjective perspective, where according to the universal minimum concept of mind he experiences only his own experiences, there is nothing else that his ideas might refer to. In the crib, the first ideas making sense of the first sensory experiences, must necessarily be purely creative speculation -- the subsequent creation of a huge structure of knowledge does not change that speculative character; in that sense, one never leaves the crib. A person

experiencing an idea that purports to describe objective physical reality is really experiencing an intellectual experience that organizes (interprets) his sensory experiences – his own private mental experiences. Individuals with minds that consist only of private mental experiences (all of us) must acknowledge inescapable and profound philosophical ignorance (therefore, doubt) about anything other than experiences. Every competent adult at any point in history interprets his sensory experiences as indicators of the character of a physical reality that, in his interpretation, (1) causes those sensory experiences and (2) exists whether or not there are humans with experiences. (Point (2) is the definition of objective reality.) The content of that interpretation (that there is an objective physical reality) is a speculative or hypothetical creation of his intellect that does not contain any attribute that rigorous reason compels it to be true. Profound philosophical doubt does not contradict confidence. It is not an error to have full confidence in a concept of objective reality the philosophical truth of which is inescapably and profoundly doubtful. Philosophically, there might be no physical reality, or if there is, it might not cause sensory experiences, or it might be exactly as conceived. Reason alone (entirely separate from confidence) precludes the conclusion that his interpretation is true, or that it's false. The most that reason can admit is that it might be true – but it might equally be false, or anything else. These are conclusions that follow directly from the universal minimum concept of mind and they seem to be what Godfrey-Smith, in the quotation above, calls the strange idea of phenomenalism.

Of course, the minimum concept of mind might be false, but it is the universal basis for social intercourse, including particularly science. There might be a different concept of mind that leads to a different conclusion, but I have never heard of one and have not been able to conceive of one myself. I invite anyone to suggest one and I hope I will be open-minded to consider it.

There is, perhaps, a difference between the conclusions I reach and what Godfrey-Smith intends by the fossils of empiricism and phenomenalism. In describing phenomenalism, he says "It's only the sensations we have any dealings with." and "Perhaps our concept of the world is just a concept of a patterned collection of sensations." I'm focusing on his use of the first person plural: "we have any dealings with" and "our concept of the world". He uses the first person plural throughout the book, not just in his discussion of fossils. Recall my concern about the importance of vigilance to prevent the substance of any discussion from being unintentionally corrupted by procedural matters. Godfrey-Smith may use first person plural purely as a procedural figure of speech with no intention to corrupt the substance, but the first person plural does contain potentially corrupting implications. The use of "we" implies that numbers of people exist. If he intends by "we" that numbers of people physically exist, then he's improperly assumed something about what he's trying to understand: the nature of physical reality. Similarly, "our concept" suggests that a concept can be a type of collective phenomenon that "we" jointly experience. My conclusions are completely contrary. In my view, the existence of anything physical, including one's own body or the bodies of other people, is a conjecture which might equally be true or false or anywhere in between and which should not be permitted to insinuate itself into the substance of a discussion on the fundamental nature of physical reality. Similarly, each experience (whether an idea or any other type of experience) exists only in the private subjective reality of the person who experiences it. Other people may or may not exist physically, and whether or not their physical bodies have experiences is a conjecture on top of a conjecture, all of which exist in the private subjective reality of an individual experiencing that idea. Other people may exist physically and they may have similar ideas (or not) but those are matters of substance and should be scrupulously segregated from procedural figures of speech. If his use of first person plural is more than a procedural figure of speech and if he actually intends that the fossils of empiricism and phenomenalism include the physical existence of other people and the joint experience of some experiences, then there is a very fundamental difference between my views and Godfrey-Smith's fossils.

Consider again these quotations from Godfrey-Smith's book:

...a problem for empiricism has been a tendency to lapse into skepticism, the idea that we cannot know anything about the world.

and

Empiricism has often shown a surprising willingness to throw in the towel on the issue of external world skepticism.

Skepticism is one of those ism names, but skepticism is also an ordinary English word and here I think Godfrey-Smith intends the normal usage which is simply "doubt as to the truth of something". I'm focusing on the word "lapse" in the first quotation. The definition of lapse is "temporary failure of concentration, memory, or judgment". My conclusions are characterized by profound doubt – pervasive philosophical ignorance about objective reality, i.e., skepticism. In the first quotation, Godfrey-Smith seems to be saying that previous philosophers who reached skeptical conclusions on these foundational issues as I have, reached their conclusions through lapses, i.e., failures of character, presumably abandonment or slackening of the rigor of their reasoning. And maybe he would think the same of mine. So far as I am able, I think I've strictly adhered to rigorous reason. And that is the project of philosophy: to apply rigorous reasoning to any question and follow the chain of reason wherever it goes. If I've deviated, I would be grateful if he would identify where. That said, it's understandable that people following the chain I have outlined might want to "throw in the towel"; after all, skepticism seems to be a dead end. If the object is to understand objective reality, then the idea of profound ignorance about objective reality seems tantamount to a complete failure to achieve the object. But in my view, they threw in the towel too soon. Throwing in the towel was itself a lapse. Perhaps they didn't consider that the project of science is not to understand physical reality by means of a set ideas that are "true" to a standard of philosophical certainty. The project of science is not primarily to understand physical reality at all, but to master it, to control it, put it to use, to raise the standard of living, win a Nobel prize and glory. Perhaps, the best way to master physical reality is to understand it, but the primary object is mastery, understanding is secondary; furthermore, understanding physical reality according to one set of coherent principles would be tertiary. If scientists encounter a philosophical problem, like the square root of -1, they couldn't care less. If they concoct some principles that work to achieve mastery over nature, they develop confidence despite the many unresolved questions that every area of science (and much of normal life) circumvents as it progresses. Confidence operates by a set of principles that might seem different from the principles that govern mathematical-type rigor. But it's my contention that the principles governing confidence are also understandable by normal reasoning, just not the simple true/false principles that we associate with mathematics and science and that (some) philosophers try to apply to other areas. Or so it seems to me.

In my view, the truth of any idea is profoundly and inescapably doubtful; therefore, the word "skepticism" does properly apply. But I don't like the word because, in addition to meaning doubt, it carries the innuendo there is nothing more to be gained from contemplating ideas that are doubtful and that doubt really is a dead end: best to throw in the towel and try something else. The innuendo connotes pessimism and failure. If one is "skeptical" about the truth of an idea, then that suggests, as a matter of pure innuendo, that the idea is probably wrong. I completely disagree with that innuendo. I am skeptical about the philosophical truth of any idea, but I certainly would not say that any idea is probably wrong. My kind of skepticism inclines neither to the truth nor to the falsity of any idea. Instead I prefer another word which includes the same inescapable and profound doubt, but instead

carries an optimistic innuendo that encourages further contemplation. That word is “hypothetical”. To call an idea an hypothesis is to acknowledge the full profound doubt (skepticism) as to the truth of the idea. But to articulate an hypothesis (the philosophical truth of which can never be demonstrated in any chain of reason) is just the beginning of an effort to explore the domain within which the hypothesis might be efficacious. If an hypothesis demonstrates efficacy, then the more efficacy, the more confidence. And with confidence, the inherent hypotheticality of an efficacious idea is conveniently forgotten. That lapse of memory is practical virtue but a philosophical vice.

I began with the quotation from Godfrey-Smith's book summarizing empiricism by the slogan “the only source of knowledge is experience”. That quotation appears at the beginning of Chapter 2. But in the Introduction, Chapter 1, he offers a slightly different slogan to summarize empiricism: “The only source of real knowledge about the world is experience.” I'm focusing on the word “real”. It suggests that some knowledge is real and some not, but it's not clear what the distinction might be. And to be fair, he is clear that both these quotations are just summarizing slogans which I take means that they are not intended to be dissected with great precision. That said, philosophy in general seems always to be looking for, but never actually identifying, a kind of sacred truth beyond doubt. That, in my view, is a dead end. On the contrary, structures of knowledge do not consist of true ideas linked together by chains of rigorous reason; rather, knowledge consists of inescapably doubtful hypotheses linked together by historically-earned confidence. The creation of hypotheses and the recognition of the efficacy of any hypothesis are products of reason, but confidence is a separate element in the structure of knowledge.

I think philosophy in general is somewhat mistaken about true/false mathematical-type rigorous reasoning itself, and also about its application in, say, the social domain which is complex and not as amenable to true/false characterization as mathematics which concerns apparently simpler elements. Mathematics is presented as the domain in which any statement can be unambiguously characterized as true or false and where the operating principles, if properly applied, lead to conclusions that are necessarily true. Maybe mathematical statements are what Godfrey-Smith intends as “real” knowledge. Mathematics in total contains a huge structure of ideas each of which seems precisely and rigorously related to the others by clear principles. But in my view, the foundations of mathematics are just as mushy as the minimum concept of physical reality is doubtful. The historical origin of mathematics is as old as civilization itself. Counting with numbers seems to have been created to serve commerce in the earliest civilizations in the Fertile Crescent. Geometry, involving straight lines and circular curves came next presumably to serve architecture. Numbers and lines are the foundations on which fantastic mathematical structures have been developed and continue to grow. But if you ask what is a number, or what is a line, you will find the same foundational debates that characterize the fundamental nature of reality. You will not find clear definitions. Nor will you find a clear definition of the square root of -1 or of infinity or many other mathematical concepts on which very successful mathematical systems have been built. The mushiness of the foundation doesn't concern mathematicians. Philosophers might engage in endless debates without resolution, but mathematicians are very confident that mathematics works within the domains for which the different sub-divisions of mathematics were created to serve. The confidence arises not from the rigor of the reasoning, but from a long history of successful application.

My professor of introductory calculus, in his first lecture and continuing for some time, told us students not to get discouraged if we didn't understand calculus the way we thought we understood alg, trig, and geometry. His advice was not to make an effort to understand calculus; instead, we should just get familiar with the new terms and operations and gradually we would develop an understanding. We did

and we developed confidence, and some of us went on to become serious mathematicians, but the foundational gaps still remain.

I hope I do not give the impression that I think rigorous reasoning is not important or is dispensable or is less honourable than some other approach to understanding. In my view, there's nothing more important than reason; in fact it's all we've got. But reason has to be understood as more than a means to determine "real" knowledge or philosophical certainty or some such, and has to include doubt and hypotheticality and perhaps other types of apparent uncertainty. All ideas, including wrong ones, derive from the application of reason. Reason is sometimes juxtaposed to its supposed antonym "revelation", as though one has a choice to follow reason, on the one hand, or revelation, on the other. But that's a false dichotomy: even the idea that "god has revealed truths contrary to reason" is itself a creation of reason – an inefficacious idea in my experience (unless perhaps you're facing the Inquisition), but nevertheless the result of the same creative reason that created science. Godfrey-Smith cites David Hume's inductive skepticism: "why do we have reason to think that the patterns in past experience will also hold in the future?" Here are my thoughts: I agree that nothing about "patterns in past experience" implies, without more, that the pattern will hold; however, a history of uncontradicted examples of a pattern in the past invites the hypothesis that there is a cause for the pattern, and that that same cause will cause the pattern to hold in the future. That hypothesis is a pure intellectual creation without rigorous foundation. But what one calls a pattern is itself a pure intellectual creation. It seems perfectly obvious that reality is divided into separate "things", but the attribution of thingness to different parts of reality is itself a pure hypothetical creation that presumably reflects an inherent creative intellectual capacity or inclination that seems to be universal. The identification of "thingness" is at once highly creative, the product of rigorous reason, and yet fully hypothetical. A pattern is a group of things organized according to principles also creative, rigorous, and hypothetical. The question Hume should be asking is not whether there is some rigorous reason to be certain that patterns will hold, but rather is there benefit to be gained by hypothesizing that patterns will hold and then what experimental results will give confidence that the hypothesis is efficacious, all the while acknowledging that the hypothesis can never be verified to a level of philosophical certainty.

I think there is a strong connection between "patterns holding in the future" and causation. Whenever one identifies a past pattern (a pure hypothesis), one also hypothesizes that there might be a cause for the pattern. I'm going to hypothesize what is the first concept of causation suggested by the minimum assumptions that each person brings to any normal social scenario: the concept that much of the behavior of each person's body is caused by his volition. The minimum concept of mind necessary for normal social interaction includes the idea that individual minds include volitions. There are specific experiences that constitute volition and now is not the time to describe them extensively, but every competent adult understands volition without necessarily being able to articulate it; he can recognize the specific experiences without detailed analysis. The first element of volition is a decision to make one's body behave in a particular way. That first element is the experience of an idea: I'm going to make my body do XYZ behavior. If one has already learned how to make one's body do XYZ behavior, then one knows as an intellectual matter on what one has to concentrate to make the body do XYZ behavior. Concentration is a complex aspect of the concept of mind but the experiences of concentration include (1) direction (what one is concentrating on) and (2) intensity (how hard one is concentrating, also called effort, or will power). And so if two brothers are hunting in the Brazilian rain forest and one raises his arm to spear a prey animal, they both understand that the one who raised his arm had made a decision to do so, then concentrated on the specific output reflex that he had learnt will cause his arm to raise, and then made exactly the right effort to raise his arm with the spear. The decision, the identification of the output reflex, the concentration on that output, and the effort to raise

the arm, in combination, constitute volition. We can speculate what understanding of volition an infant has in the crib. Infants don't seem to have to do much learning to suckle or grasp, and it seems as though parents or development psychologists can follow what body control skills an infant learns day by day. Each step in the learning process is a demonstration to the child that his volition can cause his body to behave accordingly. The volition is the cause and the bodily behaviour is the effect. You can imagine the philosopher/scientist in the crib: maybe if I try this, my body will do that. In the minimum concept of mind, each person goes through the same learning processes. There's no short cut. Parents might try to help, but the infant has to conceptualize that there are parents or other people or even things in physical reality, and has to do his hypothesizing, experimenting, and philosophizing on his own. Parents can see the child's confidence developing with each skill. Easy to imagine the child develops confidence and, in proportion, abandons any notion that the whole process involves hypothesis. This is not proof, but it's easy to imagine how the child could understand causation to be the link between the pattern of volition followed by bodily behaviour. And from there it's easy to imagine the child applying the same principle of causation to other patterns he encounters. This raises a scientific/philosophic problem at the current state of the art: if volition causes bodily behaviour, then mental experiences cause physical effects; however, that contradicts the whole concept of an objective physical world that behaves as it does whether or not humans exist or observe it; furthermore, the laws of physics are supposed to be exhaustive – there are not supposed to be non-physical (e.g. mental) causes of physical effects. But each person ignores this philosophical problem as it applies in any normal social scenario, including scientists doing experiments in their own laboratories trying to understand how brain behaviour (a physical phenomenon) might cause volition (which consists of subjective mental experiences). Which causes which?

It's my conjecture that confidence displaces hypotheticality and tentativity, as a matter of psychological efficiency, but philosophically, the profound doubt inherent in hypotheticality remains unchanged. Hypotheses at every stage involve creativity and reason, but no certainty. The more the pattern holds, particularly if it holds through experimentation, the more confidence one has in the hypothesis despite the profound inductive skepticism. For an ordinary person who has successfully applied an hypothesis many times throughout his life without contradiction, it is best to forget the initial (and continuing) hypotheticality altogether and just confidently do what needs to be done. For a philosopher, it's essential to remember without lapse that every hypothesis is purely hypothetical, i.e., doubtful. Hume ought not to have thrown in the towel.

What I'm calling the foundational issue, the nature of objective reality given each individual's confinement to his own subjective experiences, is summarily dismissed in the first pages of Godfrey-Smith's book. I'm reminded of Dr. Johnson's *argumentum ad lapidum*. Apparently Boswell and Johnson were standing outside a church in animated discussion of Bishop Berkeley's idea that rigorous reason prevented any individual from making any certain statement about physical reality. Both of them agreed that it was a preposterous idea but Boswell persisted, purely for argument's sake, to challenge Johnson to refute it. His temper piqued, Johnson replied: I refute it thus. Whereupon he kicked a stone -- the stone being such an obvious aspect of objective reality that any questioning of its objective character was so far beneath contempt that it was not worthy of the effort of refutation by serious reasoning. To this day, the evasive dismissal of any idea by nothing more than contempt is called *argumentum ad lapidum* – appeal to the stone. I wouldn't characterize Godfrey-Smith's dismissal of phenomenalism as contemptuous as he seems more the historian of philosophy reporting on trends of thought than describing his own, but it's my impression that philosophy in general has contemptuously evaded this foundational issue rather than facing it straight on. Where is the reasoned refutation? I haven't seen one, or even seen one attempted, and none appears in Godfrey-Smith's book. Of course,

I'm just a layman watching great athletes and maybe there is a convincing refutation somewhere, but the utter absence of any in the book suggests to me that there isn't any. And that seems to me a very serious "lapse" by the whole philosophical community.

Almost two hundred pages follow Godfrey-Smith's description of philosophical fossils. Much of it concerns the sociology or practice of science which is interesting in its own right. And there is one chapter that seems to demonstrate the point of the Sokal hoax -- I hesitate to commit my own *argumentum ad lapidum*. But in large part, the rest of the book describes different schools of thought the whole point of which seem to me to be to circumvent the foundational issue without actually facing it or naming it, as though the foundational issue were a crazy old aunt in the attic whose presence is always felt but whose name is never mentioned. To say that the foundational issue is not really faced or named is my own characterization; Godfrey-Smith might say that these different approaches continually try to deal with the foundational issue and that wouldn't be wrong. When I say they don't face or name the foundational issue, I mean they don't acknowledge the full significance of the development of intellectual foundations "in the crib". It's one thing to acknowledge, in general, that the only source of knowledge is experience; but it's quite another to recognize that intellectual foundations are created from experiences when one is alone "in the crib", and that one never leaves the crib. The principle aspect of the foundational issue that is not faced or named is one's own inescapable solo or solitary subjective circumstance: one only experiences only one's own experiences -- always and everywhere, even if one should hypothesize that he has left the crib. It seems to me that the ubiquitous first person plural (not just in Godfrey-Smith's book) is more than just a procedural figure of speech; rather it reflects a general difficulty of individuals to conceive of themselves as something other than a part of a family of humans occupying objective space and time. Consider the "standing on the shoulders" metaphor. That metaphor illustrates that one person can learn from another and knowledge can accumulate through generations. Successors can learn core principles from predecessors without having to make the full effort to conceive and refine and articulate core principles that predecessors made. Parents can teach things to their encribbed children. But in order for one person to learn from another (to stand on his shoulders), the first has to conceive (hypothesize) that he is a person, that the second is another person, and that this other person has something to teach him -- all of which is inescapably and permanently hypothetical (doubtful) even though, in the course of normal development, the first person will become very confident in the efficacy of his hypotheses. I suppose confidently held hypotheses should be called theses. The creation of foundational theses (which include one's own personhood) logically precedes personhood itself. There are no shoulders to stand on in the formation of intellectual foundations, no shoulders to stand on in the crib. Once the foundations are conceived, those foundations include an objective reality with other people who have shoulders, but the whole structure, including the shoulders of others on which one might conceive one is standing, are one's own creation. In describing foundational issues, first person plural is misleading even if it is honourably intended as a purely procedural figure of speech.

I've described some of my own layman's thoughts about intellectual foundations that each person (lay and otherwise) conceives on his own in the crib. Those foundations include a basic understanding of mental experiences (philosophy of mind or model of mentality) which I've touched on only so far as necessary to deal with the understanding of objective reality. What I call "understanding of objective reality" corresponds to the title of Godfrey-Smith's book (Theory and Reality) and my views differ in fundamental respects from any of the schools of thought presented in the book. If one cannot circumvent one's profound ignorance of objective reality, then what can one say about reality in general. I suppose I should round out my layman's description of intellectual foundations with my own description of reality. But first I should address the philosophical school of solipsism. Solipsism is one of

those ism names that means different things to different people. The word does not even appear in Godfrey-Smith's book (the unspoken name of the crazy old aunt?). It's often used in the expression "abyss of solipsism". Stay away!! Philosophers are warned not to fall into the abyss of solipsism which leads to a slow death of agonizing torture. It is precisely to avoid that torture that skeptics throw in the towel.

I hesitate to describe a school of philosophical thought that is identified with an ism name. I've never read any original solipsistic material, and I might be historically inaccurate and misstate the philosophical principles. I'm not sure who would be considered founders or spokesmen of the school. That said, it's my understanding that solipsism includes the idea that individuals are profoundly ignorant of objective reality because they experience only their own experiences. From that starting point, solipsism then derives that there is no objective reality, that "I am the only mind that exists.", and "Existence is everything that I experience." etc. I don't even agree with the starting point. As a starting point, before foundations are conceived, there are no individuals, not even one's self. There is nothing but free floating subjective experiences from which reason creates hypothetical organizing principles – first, a philosophy of mind, second a philosophy of objective reality, and finally, a philosophy of social reality, i.e., people including oneself and other people with their own minds). First, second, and finally in the previous sentence do not connote a temporal order. One never leaves the crib in the sense that these hypothetical principles are ever philosophically verified, but one develops confidence in one's understanding and abandons doubts about intellectual foundations, and conceives that one has left the crib which makes perfect practical sense but is a philosophical leap. Solipsism starts from the foundation that there is a self, a person who experiences his experiences. Is that a solid philosophical foundation? In my view, no. The concept of oneself is just that, a concept, an essential concept for practical life, but fundamentally hypothetical and conceived to organize experiences in the crib like all other concepts. All concepts (not only concepts describing objective reality) are inescapably hypothetical -- the only way one hypothesis might be verified is by other concepts which equally require verification – an endless process; therefore every concept remains hypothetical. And so if the concept of oneself is hypothetical (therefore possibly wrong), who would be experiencing what seem to be my experiences if my self-concept is wrong and I don't exist? Answer: one's own subjective experiences do not necessarily have a subject that experiences them. One's self-concept itself exists as one experience among all the others. Subjective experiences without a subject. And that's what I intend by the neutral-sounding pronoun "one". That deals with the starting point of solipsism. But even if that starting point were valid, even if there were a self that experienced experiences, it does not follow that there is nothing but experiences. There might be an objective world exactly as scientists hypothesize even though those hypotheses are not philosophically verifiable.

So then, of what does reality consist? Reality consists of subjective experiences. In a normal social context, "subjective experiences" means the experiences of individuals. Conversation between individuals is a normal social context. Writing something to be read, or reading something that has been written, are two halves of a conversation – also a normal social context. But at the foundation level, if one analyzes what one calls the social context in which one finds oneself, the elements into which that whole scenario (or any other scenario) can be analyzed consists of one's own experiences, and that includes the recognition that oneself itself exists only as an intellectual experience. All consists of present experiences, including concepts of the past. The reality of present experiences is undeniable – does not depend on the truth of any concepts. All concepts are potentially false, but the experience of any experience, including a false concept, is undeniable when it is experienced. Undeniable subjective reality contains hypothetical objective reality, not vice versa.

I hope I don't have to emphasize that confidence in intellectual foundations is not an error despite inescapable doubt. In normal usage, to say you're skeptical about an idea is to say that you think it's probably false. But it would be unwarranted to conclude that an idea of objective reality is probably false from the profound ignorance one has about it; on the contrary, profound ignorance prohibits any rigorous conclusion about objective reality, i.e., profound ignorance equally prohibits the conclusion that there is no objective reality or that there is one. Furthermore, reason applied to history supports full confidence in the efficacy of what seem to be universal intellectual foundations.

All in all, I would say Godfrey-Smith's book leaves me satisfied that it provides a bare-bones introduction to the philosophy of science. I'm surprised that what I assumed were philosophical issues faced by scientists were not included. I'm surprised that the foundational issue is included. It's my impression that none of the schools of thought presented in the book that purport to deal with the foundational issue acknowledge the inescapable hypothetical character of the normal layman's or scientists' view of objective reality. They raise interesting questions but have not advanced beyond the point where empiricism threw in the towel. That too surprises me.