Thinking about Thinking

Thinking about Thinking:

A Physician's Guide to Epistemology

By

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To Ernest Nagel who steered me toward medicine
and
Michael Resnik
and
Ronald Munson
who steered me back to philosophy

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ACKNOWLEDGEMENTS

Any author will confess that it is very difficult to cite the many people that have contributed to a book. I am no different. Although my interest in this subject dates back to high school it was certainly strengthened by the core courses at Columbia known as Contemporary Civilization and Humanities. These are and remain the bulk of the work in the first two years of college and are generally taught by senior faculty. Anyone who went through them will acknowledge their influence on future academic endeavours. Specific teachers and students are too numerous to mention. However, I was a philosophy major and Ernest Nagel, to whom this book is also dedicated, was instrumental in encouraging me to pursue medicine. Likewise, in medical school at New York University and residency at the University of North Carolina at Chapel Hill, the intellectual rigor and constant mentoring of students focused and honed my skill at pursuing intellectual problems. While mentors at these institutions and at The University of California San Diego and Harvard Medical School provided the academic medical environment for my profession, the only true mentors for this work were Michael Resnik Philosophy Professor at University of North Carolina at Chapel Hill and Ronald Munson Professor of Philosophy at University of Missouri for whom this book is dedicated. In particular Ronald Munson read a draft of the manuscript and offered many sage comments and examples that I used to illustrate the concepts addressed. Of course, the responsibility for the accuracy is mine as is responsibility for any errors. Lastly, I would like to thank Simon Richardson for editorial assistance.

PREFACE

It is easier to explain what this book *isn't* about rather than what it is. It isn't a textbook or an essay or a lecture. It uses material from history but it isn't a historical account. It covers several topics within economics, especially behavioral economics, psychology, logic, mathematics and, most importantly, philosophy. However, it can't be called a formal philosophical work, since it doesn't stake out a philosophical position, explain the claim, give the implications of that claim, then defend it from potential criticisms. It does address certain philosophical positions, but primarily to describe them and, occasionally, dismiss them.

I am not a professional philosopher and this means that I may not give adequate weight to the positions I reject. I may even have misstated a philosophic claim but that is my responsibility alone. It is more of a commentary than anything else and I hope that the annotated references will give you, the reader, a clearer view of the issues I have dealt with. The point of the book is to go beyond the limits of philosophy in the study of epistemology – the theory of knowledge - drawing from other disciplines that make contributions to understanding what knowledge is, how we acquire it and how we defend it.

The book draws from a range of sources and viewpoints, as my position is that all cognitive activity addresses epistemology in one way or another, and we should therefore examine the entire range of cognitive disciplines to gain a firmer idea about knowledge. This means that each segment of the book is short and easily digestible, and the style is conversational and, hopefully, engaging. The content focuses on medical issues as that is my area of expertise, but the book can be understood by anyone with a college education. I have purposely left out almost all technical discussions, especially regarding logic and mathematics, partly to avoid discouraging anyone, and partly because it is unnecessary for my goals.

And what are those goals, you might ask? In this book, I hope to survey many, if not most of the disciplines that address the nature of knowledge and how we acquire it. While this makes for a diverse book (which reflects my personal interests), it also covers contributions to the study of knowledge (epistemology) that go beyond each discipline's individual

contributions. I draw from history, philosophy, economics, psychology, mathematics and statistics. The order of chapters follows the evolution of thought, from the most basic notions of common sense and intuition, to the more analytical concepts of logic. It then moves on to more technical areas such as mathematics, statistics, decision theory and, finally, a central concept in clinical medicine – that of diagnosis.

Along the way, there are asides into related topics such as tautologies, paradoxes and truth. I hope you come away with a much more rounded view of the study of knowledge and how it transcends all the disciplines that take various stabs at understanding the process. Each chapter is sufficiently independent of the rest to be able to stand largely on its own, but it makes for a better flow if it is read from beginning to end. While there is a focus on clinical medicine, it is not a text for doctors or people working in medicine; rather, it is for anyone who is interested in how we acquire knowledge.

Hopefully, there are enough anecdotes to keep you interested, but the subject matter is dense and not trivial. Although each segment is brief, the references go into more detail with sometimes exhaustive discourses. All of the references are books, as published papers would overwhelm the narrative. Think of this as a sequel to our book on clinical reasoning, published in 1988 (Reasoning in Medicine: An Introduction to Clinical Inference by Albert, Munson and Resnik), but covering different ground. It may also be considered a testimony to the undergraduate education program at Columbia, which has Contemporary Civilization as a required course.

This extremely intense dive into the most important concepts in Western Civilization was crucial to my intellectual development and, as a peculiar byproduct of the COVID 19 pandemic, I was able to reread the entirety of the course material (consisting of two immense volumes).

Of course, there are distinct limitations to this book. First, I have little knowledge or understanding of Eastern thought, and to the extent that it addresses these issues, this book is deficient. Also, there are areas within philosophy to which I have had little exposure, but which I have nevertheless addressed briefly. For example, the sections on reflection and abstraction are dealt with in phenomenology (the study of existence and appearance) but I have little patience for works by authors such as Heidegger and Hegel. I also ignore the entire discipline of existentialism and most of what has been termed 'continental philosophy.' This is not to say that existentialism, phenomenology and continental philosophy don't

contribute to epistemology; I just am not the right person to address them. My hope is that the book will be read by an audience that is not burdened by preconceived positions on these issues, and one that is open to a new approach for what it is worth. When I do engage in philosophical issues, they are more completely and better addressed in The Encyclopedia of Philosophy (a four-volume text) and the Stanford Encyclopedia of Philosophy (an online, updated reference work of considerable complexity). Take a look at these regardless of whether you decide to engage with them in depth. They, and the references I have listed in this text, will greatly enlarge and embellish the discussions in this work.

One word of warning, though: The material is technical and difficult. However, I address the same issues from different perspectives as the book proceeds, so if you find yourself scratching your head or feeling confused, do bear with it as it is likely to become clearer in a later chapter. This is especially true for the introduction, which could be read after the subsequent chapters as it summarizes much of what follows. Alternatively, you could read it as an introduction, then read it again after the rest of the book is completed. In closing, I hope that the book is an enjoyable read. It certainly was fun writing it.

INTRODUCTION

The Thinker by Auguste Rodin

As Bryan Magee points out in his introduction to *The Story of Philosophy*, the fundamental questions that the subject tries to answer concern the nature of existence (ontology) and the nature of knowledge (epistemology). However, underlying each of these enterprises is the question of how reasoning can answer these questions.

The premise of this book is that we can address questions of *what* we think we know and *how* we think we know the answers to questions, but that questions of *why* may be better left to religion, as they cannot be answered through reason alone. As we will see later, the relationship between cause and effect appears to be a concept that is only used to assign blame or achieve practical results, like charging a car battery when it won't start because the lights have been left on. Questions of a more existential nature like "why do we exist?" require what Kierkegaard called a "leap of faith" and, consequently, we won't deal with them here. However, our "what" and "how" questions require reasoning that is rooted in philosophical analysis. This will allow us to address epistemological questions of knowledge on both an empirical and analytical level. The introduction lays out many of the issues that will be dealt with in more detail in the chapters that follow, so don't be discouraged if you can't initially follow the discussion: what follows will be more expansive and, hopefully, more approachable.

Epistemology is an ancient but vibrant field of philosophical study. Plato, who wrote in his Meno that 'knowledge is the basis for virtue and happiness,'

distinguished between two domains of knowledge – the physical and the spiritual. To achieve knowledge, he thought that there were four stages – imagining, believing, thinking and perfect intelligence. This is not so far from the present paradigm of knowledge as 'Justified True Belief' (JTB). However, JTB ran into a roadblock known as the Gettier problem, which was published in a three page paper in Analysis in 1963 by Edmund Gettier. In this document, he noted that JTB can lead to false conclusions if the statement in question is simply linked to a known truth through an either/or conjunction. For example, *either* the moon is made of green cheese *or* 60 seconds constitutes a minute. The disjunction is true but the clause regarding the moon is false. In my view, though, this Gettier type-2 counterexample is a non-problem which arises out of an illicit use of the truth value of an 'or' statement. This is similar to many paradoxes (many of which we will discuss later) that arise out of twisted versions of logic, such as the liar paradox. In a different way, Goodman's new riddle of induction also results from a time-dependent claim that can't be verified at the present moment (we will discuss this in more detail later). That isn't to say that illicit disjunctions aren't a problem for human cognition. The famous Linda problem (which we talk more about later) dupes many people into believing that a bookish young radical would more likely be a feminist bank teller than just a bank teller. We will explore why this is a falsehood, and why people make this mistake.

In contrast, Gettier type-1 problems are conjunctions where the observer is under the false impression that two events are true at the same time (and thus have JTB), but in the end, one or both of the clauses turns out to be erroneously true. This is a classic case of "correct for the wrong reason" - a situation which is particularly common to physicians. Let's take, for example, a doctor who thinks their patient has an infection because the white blood cell count is elevated. On closer inspection, it transpires that the patient does indeed have an infection, but that the white blood cell count is elevated because they are on steroids. This happens all the time and doctors think very little about it because our conclusions are rarely based on a single piece of information. This is why clinical medicine is not logical; it is an empirical endeavor that is sometimes scientific, and sometimes just empirical with little or no supporting scientific basis. Even though I think the Gettier examples are contrived (a much better example is in the Book 'Philosophical Methods' by Williamson), the claim is correct. Ultimately, Justified True Belief is insufficient as a criterion for knowledge, which is why in a later section, I will propose 'Verified True Belief' (or its weaker sibling - Confirmed True Belief) as a more satisfactory criterion for knowledge.

As is the case in all fields of philosophy, there are various schools of thought in epistemology. For example, Foundationalism contends that there are essential propositions which do not require external support (like axioms) and are the foundation of knowledge, as in Lord Russell and Alfred North Whitehead's 'Principia Mathematica.' Others contend that the strength of a proposition is dependent on coherence with other supporting statements, as in Quine's Web of Belief. Other schools include pragmatism, scientism, intuitionism and, importantly, skepticism. But just when you think philosophy never makes any progress and it is all a "footnote to Plato," there are clearly schools of thought that have vanished like determinism (unless you are a religious conservative), which contends that the universe is one big clockwork mechanism that chugs along with no room for uncertainty. This Newtonian notion has now been replaced by uncertainty in the form of probability and uncertainty in the form of chaos (a deterministic form of uncertainty), leaving the whole question of free will in limbo.

While logicians, physicists and mathematicians gravitate toward foundationalism, physicians are most comfortable with pragmatism, especially those for whom inference plays the main role in deciding on "the best" explanation (otherwise known as abduction). Abduction has long been thought to play a role in the creation of hypotheses, but it is best understood as a means of deciding between competing hypotheses. The rationale of pragmatism is the usefulness or utility of knowledge and in the medical sphere it is exemplified by the diagnostic process. This method, which was popularized by Conan Doyle (himself a physician), is exemplified by Sherlock Holmes' approach, which eliminates all possible explanations before coming to a conclusion that is irrefutable - even if it is improbable. Even such eminent classical logicians as Bertrand Russell advocated for abduction, which he confusingly termed induction as a method of deciding between hypotheses.

But Conan Doyle was not the only physician interested in logic. Galen, whose fame arises primarily from his contributions to medicine, was also an eminent logician. Indeed, abduction was first explored by C.S. Pierce (who was also an early explorer of quantification, though its roots can be traced to Senna), an 18th century American philosopher, and later by other pragmatists such as John Dewey, whose definition of truth was warranted assertability rather than an appeal to an external reality. Warranted assertability rather than objective truth is a human-centric view of knowledge and rightfully emphasizes its tentative nature as a hypothesis. It focuses on knowledge as being both defensible and explanatory; therefore, by extension knowledge plays a role in prediction. As the logical positivists

clearly understood, explanation is the mirror of prediction, but by making explanation the primary focus of inference, prediction can then flow organically from explanation. This is, of course, a key feature of both scientific method and diagnostic process. The logical positivists maintained that truth was a consequence of the verification of propositions by empirical data (the correspondence theory of truth, first asserted by Plato). However, this leads to never-ending trials of theories by tests that are designed to provide supportive data. Popper realized the futility of this process and introduced the notion of falsification, whereby a theory is tentatively accepted until falsifying data leads to its abandonment. This is much like Kuhn's theory of paradigms whose edifices can eventually come tumbling down under the weight of falsifying data.

Falsification does a better job of discarding hypotheses than verification does in confirming them, which is basically an extension of Hume's critique of induction in the first place. For example, no matter how many times the sun rises in the morning, it is insufficient to conclude that this will always happen. That is to say, until falsifying data appears, we need to go forward with confirmatory data. However, explanations aren't all equivalent; some are more compelling than others. The most cogent explanations seem to obey certain rules. These include simplicity (for example, mathematical proofs), coherence with supporting knowledge, explanatory generalizability (i.e., applying to a range of phenomena, not just one), and a lack of dependence on ad hoc elements that have only been brought to bear to bolster the explanation (Ockham's Razor, another eminent logician). Some of the distinctions between the rules of inference and epistemic truth were pointed out by Bradley in his comparison between validity and soundness in an argument. We will expand on this confusing concept in the section on Deduction. A more contentious claim is that there is no such thing as truth outside of a paradigm. That is to say, truth is contextual. All this is very dense but it will be fleshed out in later sections.

It is difficult to discuss epistemology without making reference to Kant, whose contribution was to clarify a distinction between axiomatic (or analytic) propositions, which he labeled *a priori* (necessary), and empirical or synthetic statements, which he labeled *a posteriori* (contingent). While this is an oversimplification and indeed, ideas of this nature can be traced all the way back to Aristotle, this distinction is a codification of foundationalism. If this were all he did, the contribution would have been modest, but Kant went on to characterize a class of claims that are 'synthetic *a priori.'* For example, *a priori* analytical statements can be exemplified by definitions such as "unmarried men are bachelors," whereas *a priori*

synthetic statements are not definitional but convey new information, such as "5+7 =12."

Of course, one can argue about both kinds of *a priori* claims. Unmarried men could be children, which does not fit with our conceptualization of bachelors. This is because the connotative meaning of the word itself implies the possibility of marriage. Similarly, 5+7=12 is not necessarily true in all mathematical programs; e.g., binary logic. Alternatively, a Foundationalist could claim that 5+7=12 is not synthetic at all, as it is the direct result of the axioms of arithmetic. As such, it is *a priori* analytical. This is in fact what Russell and Wittgenstein tried to do, but they ran into some problems that turned out to be unsolvable. Nevertheless, some philosophers and mathematicians believe that all mathematics can be reduced to logic if you add set theory. But since there is no one set that contains all subsets, even this theory has its limitations.

Furthermore, some philosophers claim that *a priori* knowledge is innate knowledge, which seems at odds with the development of cognitive capability of infants and children, but perhaps innate knowledge is closely aligned with the wiring of our brains once we have developed cognitive skills. On the other hand, empirical knowledge is acquired through the senses, but how do we know whether an animal is a dog unless we have an understanding of what a dog is in the first place? This is the position of philosophers who believe all observation is hypothesis laden. What this means is that you cannot categorize an animal as a dog until you have a notion of what a dog is. The only situation that Kant thought was impossible was an analytical *a posterior* statement, but even this is debatable, since the most analytical of all statements, the law of the excluded middle (P V-P P or not P), is actually incorrect in the intuitionist conceptualization of mathematics. What does seem to be true, though, is that no *a posteriori* statement can be proven by argument alone as it depends on experiential data. As we will try to emphasize throughout this book, claims to truth, especially foundational truths, are difficult to support. In fact, the whole idea of analytical truths, at least according to WVO Quine (a famous logician), is suspect. What does it mean to be true? Is it the concept that bears truth, or the proposition alone? Is the statement "no unmarried man is married" the same as "no bachelor is married"? As they refer to the same thing, they are synonymous, but they have vastly different connotations (see Quine and Goodman for more extensive discussions) just as the evening star and the morning star have the same extension (Venus) but are used entirely differently (as per Gottlieb Frege – a famous logician and mathematician).

Talking about secondary characteristics as Goodman does misses the point that the two designations have a whole family of connotations that are incompatible (see Wittgenstein). therefore, just because their extensions (meaning the objects they refer to) are the same does not in any way assure that they are synonymous. “Morning star” and “evening star” are good examples of two designations that refer to the same object (Venus) but which have vastly different connotations. Other examples of analytical statements are equally suspicious. For example, is it necessarily true that if today is Monday, tomorrow will be Tuesday? Maybe so, but not if you are in an airplane going through time zones. What about “a square has 4 sides”? Yes, but isn’t that just a convention? Besides, what process do you need to go through to verify these statements? By definition it cannot be by an appeal to empirical evidence because that is what defines a synthetic *a posteriori* proposition. At this point, I think most philosophers have given up on the distinction between analytical *a priori* claims and synthetic *a posteriori* statements. However, it is important to note from an historical standpoint that the distinction was critical to analytical philosophy, and its descendant is logical positivism (i.e., the Vienna Circle).

The logical positivist claim was that all statements were either analytical or verifiable, meaning that they are either true by their logical structure, or true by empirical data. Thus, the basis for meaning was either analytical (by definition) or verifiable. Even Ronald Reagan was a logical positivist in this sense, as per his famous quote, “Trust but Verify” in contrast to a pragmatist view of meaning as useful. Unfortunately, he was a little out of date in this regard since logical positivism had long since been abandoned, precisely because verification was as difficult to use as a criterion of truth as induction is for very similar reasons. No amount of positive information can fully assure the presence of a truth. All swans are not white, for example.

The flip side of Foundationalism is skepticism, which is sometimes attributed to Descartes (although it, like almost everything else in Philosophy, really dates back to the Greeks, especially Carneides). Descartes famously said, “I think therefore I am.” Now, he didn’t really say it, but the intent is the same as what he did say. In reality, his argument was quite a bit more sophisticated. He reasoned that he could doubt all knowledge except the fact that he could doubt. Since doubting is thinking, if he does engage in doubting, he must be engaging in thinking. In pursuing this line of thought, he was trying to get to the root of what he could know for sure, but other skeptics have gone beyond and claimed that there is no such thing as knowledge – a concept that, again, can be traced back to the Greeks. Since Descartes did arrive at a fundamental proposition, he could be considered a

foundationalist (in keeping with his day job as an exceptional mathematician), since his skepticism terminated with his knowledge of himself. Many of these concerns are reflected in discussions of certainty, which is generally considered to be a key ingredient of correct logical propositions and sensory claims (Regarding the latter, there is no way to validate sensory claims so they can be removed from our purview, but logical propositions that preserve truth function are candidates for claims of certainty).

Building on this observation, one could enumerate several types of knowledge, including *a priori* (or axiomatic), perceptual (what our senses tell us), memory, and inductive (the result of cumulative observation). Unfortunately, none of these types of knowledge is infallible. Because we often need to validate our conclusions to other observers, there are types of justification that support a knowledge claim. Sometimes, we resort to causal explanations, sometimes to shared experience, sometimes to a third-party source (like an encyclopedia or, more currently, Google). Again, in spite of strong validation arguments, these propositions can be fallacious. In the end, it is not necessary to appeal to tricks of logic like the Gettier problems, in order to be skeptical of all and any knowledge-based propositions. While skepticism might be the most defensible position regarding claims of knowledge, it gets us nowhere in day-to-day activities and concerns. Furthermore, skepticism itself may be the victim of a paradox similar to the Liar Paradox, which is as follows: "If there is no reason to believe any statement, why is there reason to believe this statement?" Basically, resolving all doubt raises the bar too high as a criterion for knowledge or truth. We need to move forward, and denying all knowledge is not a viable path. In the end, a true skeptic would make a terrible doctor.

Let's start with the conventional concept of knowledge as justified true belief. Clearly, this is a human-centered cognitive claim. Belief is our own mental process, but justification can come from within - such as perceptual support, or external support such as testimony. Truth is conventionally thought of as totally independent of the person possessing knowledge, since it reflects the state of the world. This is exactly why knowledge is so important—it links our beliefs to the state of the world. Whether this is correct is a matter of some debate, since there is reason to believe that, at least on some level, there is not a static "state of the world." However, knowledge can generate explanations for the perceived state of the world and predictions about future states of the world. Both processes are critical in the care of patients, and we need to accept some risk of fallibility in order to generate explanations (causal or otherwise) and predictions, which are the primary cognitive enterprises in making diagnoses.

For the most part, making a diagnosis (or at least a tentative diagnosis) is required in order to predict the results of testing and treatment. But as we all know, neither belief nor knowledge is an all-or-nothing phenomenon. We have degrees of belief and, consequently, incomplete knowledge. Thus, in the end, we need to weigh the degree of certainty against the possible consequences of being wrong—a position espoused by John Maynard Keynes amongst many others. This balance supports the use of subjective probability and its dependence on Bayes' theorem – a topic about which we will have much more to say later. Furthermore, some knowledge is not based on belief, nor can it be justified. For example, I know I am hungry. There is no belief here, nor does it need to be justified to be true.

There appear to be lots of types of knowledge; some are based on beliefs, some on sensations, some on testimony, some are independent of the observer, some are dependent on the observer, some are justifiable and, of course, some are not.

Borrowing from medicine, where it is said that if there are a dozen different operations for a condition, then none of them is satisfactory, we can say that all of these schools of thought about knowledge have their virtues, but none are entirely satisfactory. What follows is a compilation of the types of inferential reasoning typically applied in the care of patients and other cognitive activity. The inferential process in the conduct of clinical care is one of the most demanding in all human endeavors, largely because of the complexity of the human body and the relatively limited factual input. Think of it this way: We have five senses and use only vision, touch and hearing for the most part in caring for patients. We have the mental capacity to deal with up to about 7 concepts at any one time, and yet, we are faced with an organism so complex that the number of bacteria in the gut exceeds the number of cells in our body and the number of stars in the Milky Way. It is a miracle that we can figure out anything about our patients, given their complexity and our limited cognitive resources. We do have multiple tools at our disposal, but none are particularly powerful, and we need to utilize all of them at one time or another. We will review all of these approaches in the chapters that follow.

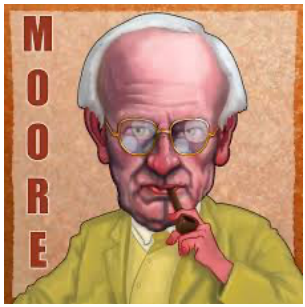
In some cases, this will require a historical approach, but for the most part, we will review types of reasoning in terms of their strengths and weaknesses, and we will also illustrate how they are conventionally utilized. Inferential reasoning is critical to clinical medicine and is epitomized by the diagnostic process. Only recently, with the attention to errors and biases, has the whole process become an important area of research. However, the process of

reasoning has been the province of philosophers since the Greeks, and there is a huge body of thought in the field of epistemology. Unfortunately, there is little attention to this field in medical training in spite of its obvious relevance. This book explores the breadth of the issues in a survey format that will introduce the reader to some of the most important areas, along with references that permit further investigation. Each aspect is introduced but not covered in detail, and there is no claim that the extent of the discussion encompasses all of the relevant issues. However, it does provide a useful introduction. In the end, the best analogy might be that "human inference is primarily analog, whereas computers are decidedly digital." Therefore, humans can't compete successfully against computers in digital inference, but by using many of the techniques of inference (which we will discuss), they, at least in medicine, frequently (but not always) out-compete a computer.

Before we move on, let me say this: If this discussion has been a bit overwhelming thus far, don't be discouraged, because the following chapters will expand, unpack and clarify all the issues we have dealt with in the Introduction section. Hopefully, you will find that they do so in a way that you are more comfortable with.

CHAPTER 1

COMMON SENSE



GE Moore

Common sense refers to practical judgement about everyday matters that is shared by most, if not all individuals. We are not using the term in reference to aesthetic judgement, political persuasion (e.g., Thomas Paine's Common Sense) or theological doctrine here. Rather, we are concerned with statements made by ordinary people which, for the most part, are accepted by the community. This notion, like so many others, dates back to the Greeks where again, Aristotle and Plato formed a contrast. Aristotle referred to common sense as the aggregate impact of the five senses that are shared by all people and, to some extent, by many animals. Plato, however, had a more modern interpretation, perceiving the senses as a data source, and statements as reflecting cognitive activity.

Common sense stands in contrast to rational thought, where conclusions are generated by inference from other data. This is not to say that common sense statements cannot be defended, but that they are not generated by rational thought and don't conventionally need to be defended. For example, most people will retreat from a snarling dog with the understanding that they may get bitten. In fact, they might generalize this concept and apply the same reaction to any snarling animal. Obviously, this can be defended rationally by the observation that snarling dogs may bite, but the defense is conventionally unnecessary precisely because most people share the same

perception and judgement. Hence, it is common knowledge. Furthermore, there is no training or instruction necessary to achieve this understanding, as although young children may not share this perception, they will acquire it though experience and observation. Thus, when Dr Johnson says, “I refute him thus by kicking a rock,” which is a commonsense opposition to Bishop Berkeley’s claim that all entities are abstractions, he is refuting idealism, which claims that only abstract ideals of cognitive entities exist. Idealism is relatively in line with Plato’s position. Likewise, when GE Moore declared “here is one hand,” he was rejecting skepticism in favor of common sense. Common sense, in effect, is an antidote to Berkeley’s idealism and Descartes’ skepticism.

Common sense is, in effect, heuristic (a shortcut) but one that is widely - if not universally - shared. Of course, any heuristic is a potential source of bias, so many philosophers decried this cognitive activity in favor of rational thought. Descartes in particular claimed that the only thing he was sure of is that he existed because of his ability to doubt. Most people, including GE Moore, the whole school of British empiricists and ordinary language philosophers, and most other people, accept common sense as a valid form of reasoning. In today’s world, common sense could be viewed as type one thinking (fast) and rational thought as type two (slow) thinking (we will explain this in Chapter 33: Dual Process Theory). As a general rule, in contrast to rationalists, empiricists like Francis Bacon and, to some extent, David Hume, as well as pragmatists such as C.S. Pierce and modern philosophers such as G.E. Moore, have defended common sense. In fact, some believe that common sense observations were the starting point for most rational inquiry, even in very abstract disciplines like mathematics. Here, we will confine ourselves to defining common sense as inferences about observations that are widely or even universally held, in contrast to those that need supporting data, such as scientific claims. The snarling dog example might be contrasted with an inference that all green vegetable matter is food or that all four-legged creatures are cows, which are common erroneous inferences, made by children. It is apparent from this discussion that these generalizations are acquired through experience, both direct and through teaching. However, there are also limitations including biases and heuristics, which we will cover in Chapter 33.

Some commonsense declarations are specific to clinical medicine. A good example is the question that is often posed to a physician or a nurse as to whether a patient looks sick or ill. The context to this question may be anything from a routine outpatient encounter to an emergency room situation, arising from the dilemma that patients may present with the same

or similar complaints, but with vastly different severity of illness. Chest pain, abdominal pain, headache or any one of innumerable issues can result from situations that range from trivial to life-threatening. The question seeks to ascertain the observer's estimate of illness severity. The answer could be justified by citing vital signs, pallor, diaphoresis, writhing, etc., but often, the aggregate assessment is all that is necessary to convey the urgency of the situation. While it is prized by physicians and other medical professionals, most would actually agree with Voltaire's assertion that 'common sense is not common.'

Many observers think that common sense is the starting place for all philosophical discussion. There are certain concepts we share that are taken for granted as a basis for facilitating further discussion. Examples abound but amongst them is the notion that time moves forward; it doesn't stand still or move backward. If we can't agree on this, then most ensuing inferences won't get very far. That being said, linear and forward-moving time appears to be a physical reality, but it is a very controversial one that not all cultures embrace. Indeed, the ancient Egyptians had two types of time. One was cyclical, returning to the same place every period, and was probably based on the seasons or the flooding of the Nile. The other was a single transition from the land of the living to the land of the dead, and was eternal and unchanging. In neither case did time move forward, and it certainly did not move linearly. In fact, in some versions of General Relativity, time does not move forward or linearly either, as Kurt Godel found when solving Einstein's equations (we will explore this in a later chapter).

Another shared concept is that two material objects cannot occupy the same space at the same time. This is one of many aspects of quantum mechanics that makes it difficult to conceptualize, since it doesn't seem to recognize this principle. It is said that the fundamental problem with common sense is that is far from common, which means that lots of individuals fail to recognize the obvious. Nonetheless, for rational discourse to proceed, we need to agree on a huge volume of information that constitutes our world and how we perceive it. We could not have a productive conversation if my assumption about you entailed you changing your identity as we are speaking. The Aristotelean concept of common sense was the five senses we share with other human beings, but Plato elevated it to a shared conceptual framework similar to how we think of common sense today. Descartes gave the most modern version when he spoke of common sense as sound judgement. Deviations from common sense in the sensory realm are often called hallucinations and can be induced in normal individuals

under certain sensory stimuli, such as images of puddles on hot roads or dream states. These can be induced by certain mind-altering drugs but of course, these are exceptions and recognized as deviation from accepted cognitive input. Hallucination has a more modern connotation when artificial intelligence programs fabricate answers to questions. Interestingly, artificial intelligence hallucinations are actually confabulations since they are imaginary reasoning not imaginary visual images. In fact, in typical discourse, almost everything that is, to use a Wittgenstein phrase (actually, he said "the world is everything that is the case") is in the realm of common sense, and what is discussed is a very tiny bit of information that represents the summit of a mountain of common sense. We simply acquire common sense as we grow up, and we achieve an 'adult' level of conception of the world through experience, which we gain longitudinally as we develop into an adult. When we speak of common sense, it means shared information and knowledge with which all of us are endowed, whereas beliefs represent a whole different set of information that is, by definition, not agreed upon.

Sometimes, beliefs are so widespread in a given society that they are treated as though they are common knowledge, so radical restructuring of a belief system can occur with new knowledge. This is commonly referred to as a paradigm shift. The belief system of Newtonian physics was overthrown by Einstein's revelations about time and space. What had been common sense now became an outdated belief system. So, common sense is not a static, rigidly delimited set of knowledge and cognitive processes, but is something that operates at a given time within a given society. That said, it is the basis for all our discussion as well as being at the root of all philosophical discussion, as it represents an assumption about shared information and shared reasoning. Descartes and Kant go one step further, hypothesizing that innate knowledge takes the form of *a priori* analytical and synthetic knowledge that all human beings have. This forms the basis for cognitive coherence, which allows people to share conceptual frameworks and, thus, to facilitate discussion.

However, developmental psychology would be at odds with this, citing stages of cognitive development as a consequence of continued sensory input. Proponents of this would cite the impaired cognitive development of sensory-deprived children as support for this hypothesis. Indeed, the question of whether there is such a thing as *a priori* knowledge is still hotly debated. One argument in favor is that there does not appear to be any empirical data that could be generated that would disprove 1+1=2. On the other side is the claim that mathematical truths such as this one have been acquired through teaching and experience.

So, common sense is the start of all philosophical discussion which is usually framed as a question. What is life? What is good? What is evil? And so on. To proceed, one requires a vast array of agreed-upon information and inferential processes. For example, to discuss life, we first need to agree that we are speaking of entities in our realm, not of hypothetical beings from a different imaginary world. We would also need to agree that certain processes are characteristic of living beings, such as their interactions with the world around them, which distinguish them from inanimate objects like rocks. Then, of course, we would need to agree on what interaction meant - and so on.

Common sense plays another role in philosophy: that of checking our inferences. If we got to the point of concluding that fire is alive since it interacts with its surroundings by creating heat, we would need to rethink our criteria for being alive, as fire would be a common-sense example of something that isn't alive. Positions that philosophers have held in the past that fail the commonsense criterion (which epidemiologists call 'face validity') include that time doesn't exist, the world is made of water, or that all existence is fire, water and earth. The rise of pragmatism and ordinary language philosophy has elevated the role of common sense as a shared cognitive framework. In fact, C.S. Pierce called pragmatism 'Critical Common-Sensuism' and G.E. Moore wrote an essay entitled 'A Defense of Common Sense,' which exemplified his approach to philosophy. Moore would argue that if a philosophical claim did not stand the commonsense test, then it should be discarded.

The question of where common sense comes from is hotly debated. Clearly, experience plays a role – the repeated example of dogs' results in the general assumption that all dogs have four legs, but that all 4-legged creatures are not dogs. Experience cannot be the whole story, though, since one's cognitive capacity needs to be able to accept, integrate and process this information. To what extent the structure of the brain defines these processes is a current subject of investigation. In defense of the limitations of our conceptualizations based on our senses and/or cognitive capacities, is the obvious differences in world view of non-human animals who depend on smell, such as dogs. On the one hand, this argument is supported by structuralists like Chomsky, who think we are limited by our senses and our capacity to process sensory data. On the other hand, others are impressed with our neural plasticity, which can adapt to varying circumstances in order to expand and contract our inferential processes. They cite cases in which normal neurological function is absent and unusual abilities surface, such as perfect pitch, photographic memory, or mathematical savants. Common

sense is not only used to refute obvious fallacies but it also used to acquire and generate evidential information to use in arguments about inferences. Three-legged dogs and black swans are often cited as examples that are used to point out fallacies in our generalizations.

Common sense is crucial to our day-to-day activities. Imagine how hard it would be to care for a patient if we could not agree on the fundamentals. Breathing, or at least respiration, is necessary to sustain life. A certain level of perfusion, usually signified by a blood pressure, is required to oxygenate tissues and so on. We need a vast amount of basic anatomy, physiology and biochemistry as a background for everything we do.

CHAPTER 2

INTUITION

Kant

While common sense is an inference (albeit a simple, shared and widely accepted one), intuition, as it is conventionally thought of, is in a sense the opposite, since it is knowledge that is achieved (not acquired) privately. Of course, it could be shared after the fact, but it is necessarily not held by any other individual. For example, the sensation of pain may be considered intuition, since it doesn't require inference and yet, it is knowledge. As such, rationalists have trouble with the notion of intuition, since they consider all knowledge as being a product of rational thought. Yet, there appears to be a whole body of knowledge that isn't dependent on at least explicit rational thought. Colors, sensations, visual data, and auditory phenomena are examples of intuitions, although some observers would also include hunches which are in effect predictions and, as such, are inferences rather than intuitions. Is an intuition then different from an inference, and do we then have two bodies of information – one acquired by inference, the other acquired by intuition? Linguistic philosophers would argue that the distinction is invalid since one cannot have an intuition unless it can be formulated in language. This seems implausible since prelinguistic children and animals appear to have intuitions, whether they can formulate them in words or not. Likewise, the claim that intuitions are justified true beliefs that cannot be supported rationally (as claimed by Ryle and Wittgenstein) is