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Worldviews

The main goal of this chapter is to introduce the notion of a *worldview*. As with most of the topics we will explore in this book, the notion of a worldview turns out to be substantially more complex than it at first appears. We will begin, though, with a relatively straightforward characterization of this notion. Then as the book progresses, and we come to appreciate more about the Aristotelian worldview and about our own worldview, we will come to a better appreciation of some of the complexities involved.

Although the term "worldview" has been used fairly widely for over 100 years, it is not a term that carries a standard definition. So it is worth taking a moment to clarify how I will be using the term. In the shortest of descriptions, I will use "worldview" to refer to a system of beliefs that are interconnected in something like the way the pieces of a jigsaw puzzle are interconnected. That is, a worldview is not merely a collection of separate, independent, unrelated beliefs, but is instead an intertwined, interrelated, interconnected *system* of beliefs.

Often, the best way to understand a new concept is by way of an example. With this in mind, let's begin with a look at the Aristotelian worldview.

Aristotle's Beliefs and the Aristotelian Worldview

In the western world, what I am calling the Aristotelian worldview was the dominant system of beliefs from about 300 BCE to about 1600 CE. This worldview was based on a set of beliefs articulated most clearly and thoroughly by Aristotle (384–322 BCE). It is worth noting that the term "Aristotelian worldview" refers not so much to the collection of beliefs held specifically by Aristotle himself, but rather to a set of beliefs shared by a large segment of western culture after his death and that were, as noted, largely based on the beliefs of Aristotle.

To understand the Aristotelian worldview, it will be easier to begin with Aristotle's own beliefs. Following this, we will discuss some of the ways these beliefs evolved in the centuries after the death of Aristotle.

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Aristotle's beliefs

Aristotle held a large number of beliefs that are radically different from the beliefs we hold. Here are a few examples:

a) The Earth is located at the center of the universe.
b) The Earth is stationary, that is, it neither orbits any other body such as the sun, nor spins on its axis.
c) The moon, the planets, and the sun revolve around the Earth, completing a revolution about every 24 hours.
d) In the sublunar region, that is, the region between the Earth and the moon (including the Earth itself) there are four basic elements, these being earth, water, air, and fire.
e) Objects in the superlunar region, that is, the region beyond the moon including the moon, sun, planets, and stars, are composed of a fifth basic element, ether.
f) Each of the basic elements has an essential nature, and this essential nature is the reason why the element behaves as it does.
g) The essential nature of each of the basic elements is reflected in the way that element tends to move.
h) The element earth has a natural tendency to move toward the center of the universe. (That's why rocks fall straight down, since the center of the Earth is the center of the universe.)
i) The element water also has a natural tendency to move toward the center of the universe, but its tendency is not as strong as that of the earth element. (That's why, when dirt and water are mixed, both tend to move downward, but the water will eventually end up above the dirt.)
j) The element air naturally moves toward a region that is above earth and water, but below fire. (That's why air, when blown into water, bubbles up through the water.)
k) The element fire has a natural tendency to move away from the center of the universe. (That's why fire burns upward, through air.)
l) The element ether, which composes objects such as the planets and stars, has a natural tendency toward perfectly circular movement. (That's why the planets and stars continuously move in circles about the Earth, that is, about the center of the universe.)
m) In the sublunar region, an object in motion will naturally tend to come to a halt, either because the elements composing it have reached their natural place in the universe, or far more often because something (for example, the surface of the Earth) prevents them from continuing toward their natural place.
n) An object that is stationary will remain stationary, unless there is some source of motion (either self-motion, as when an object moves toward its natural place in the universe, or an external source of motion, as when I push my pen across my desk).

The beliefs just mentioned are only a small, small handful of Aristotle's views. He also had extensive views on ethics, politics, biology, psychology, the proper

method for conducting scientific investigations, and so on. Like most of us, Aristotle held thousands of beliefs. But most of his beliefs were quite different from ours.

Importantly, Aristotle's beliefs were anything but a random collection of beliefs. When I say that the beliefs were not random, part of what I mean is that he had good reason to believe most of them, and the beliefs were far from naive. Every single one of the beliefs listed above turned out to be wrong, but given the data available at the time, every one of those beliefs was quite justified. To take just one example, the best scientific data of Aristotle's time strongly indicated that the Earth was at the center of the universe. The belief turned out to be wrong, but naive it was not.

By saying the beliefs were not random, I also mean that they form an interrelated, interlocking *system* of beliefs. To illustrate the ways in which Aristotle's beliefs were interrelated and interlocking, consider a wrong way and a right way of picturing them.

First, the wrong picture, which I will illustrate by an analogy with grocery lists. When most of us make grocery lists, we end up with a haphazard collection of items related only by the fact that we can, we hope, find them when we get to the grocery store. We could organize our grocery lists – with the dairy items in this part of the list, the bakery items in that part, and so on – but most of us simply do not bother. And the result, as mentioned, is a haphazard list with no particular relation between the items on it.

When you think of Aristotle's beliefs, do not think of them as like a grocery list of unrelated items. That is, do not picture the collection of beliefs as like the somewhat haphazard list in Figure 1.1. Instead, here is a better picture. Think of the collection of beliefs as like a jigsaw puzzle. Each piece of the puzzle is a particular belief, with the pieces fitting together in a coherent, consistent,

(a) The Earth is at the center of the universe.
(b) The Earth is stationary.
(c) The moon, planets, and sun revolve around the Earth about every 24 hours.
(d) Objects in the sublunar region are composed of the four basic elements: earth, water, air, and fire.
(e) Objects in the superlunar region are composed of the basic element ether.
(f) Each element behaves as it does because of its essential nature.
(g) The essential nature of each of the basic elements is reflected in the way that element tends to move.
(h) The element earth has a natural tendency to move in a straight line toward the center of the universe.
(i) ...
(j) ...
⋮

Figure 1.1 A "grocery list" of Aristotle's beliefs.

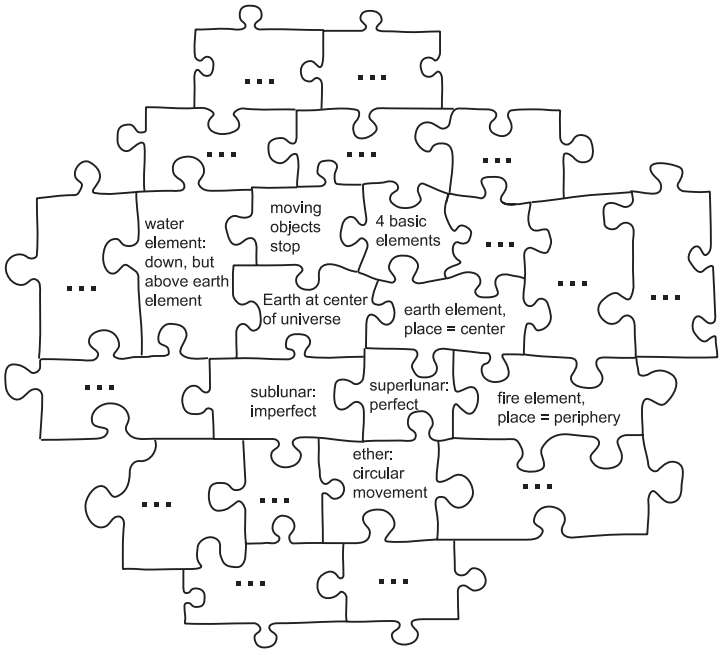

Figure 1.2 Aristotle's "jigsaw puzzle" of beliefs.

interrelated, interlocking fashion, as the pieces of a jigsaw puzzle fit together. That is, picture Aristotle's system of beliefs more as it appears in Figure 1.2.

The jigsaw puzzle metaphor illustrates the key features of the way I am using the notion of a worldview. First, pieces of a jigsaw puzzle are not independent and isolated; rather, puzzle pieces are interconnected. Each piece of a puzzle fits with the piece next to it, and that piece fits with the pieces next to it, and so on. All the pieces are interconnected and interrelated, and the overall result is a system in which the individual pieces fit together into an interlocking, interconnected, coherent, and consistent whole.

Likewise, Aristotle's beliefs fit together, forming an interlocking, consistent system. Each belief is closely tied with the beliefs around it, and those beliefs in turn are closely tied to their surrounding beliefs, and so on.

To take just one example of how Aristotle's beliefs fit together, consider the belief that the Earth is the center of the universe. This belief is closely interconnected with the belief that the element earth has a natural tendency to move toward the center of the universe. After all, the Earth itself is composed primarily of the earthy element, so the belief that the earthy element naturally goes toward the center of the universe, and the belief that the Earth itself is at the center of the universe, fit together nicely. Likewise, both of these beliefs are closely tied to the belief that an object will only move if there is a source of motion. Just as my pen will remain stationary unless something moves it, so too with the Earth. Having long ago moved to the center of the universe, or as close to the center as they could, the heavy elements comprising the Earth will now remain stationary, because there is nothing powerful enough to move an object

as massive as the Earth. All of these beliefs are, in turn, closely connected to the belief that the basic elements have essential natures, and the belief that objects behave as they do largely because of their natures. Again, the general point is that Aristotle's beliefs are interconnected like the pieces of a jigsaw puzzle are interconnected.

In addition, notice that in a jigsaw puzzle there are differences between the core pieces of the puzzle and the peripheral pieces. Because of the interconnections, a central, core piece cannot be replaced with a different-shaped piece without replacing almost the entire puzzle. A piece near the periphery, however, can be replaced with relatively little alteration in the rest of the puzzle.

In a similar vein, among Aristotle's beliefs we can distinguish between core and peripheral beliefs. Peripheral beliefs can be replaced without much alteration in the overall worldview. For example, Aristotle believed there were five planets (not counting the sun, moon, and Earth). Five planets are all that can be distinguished without the technology of recent years. But had there arisen evidence, say, of a sixth planet, Aristotle could easily have accommodated this new belief without much alteration in his overall system of beliefs. This ability of a belief to change without substantially altering the overall system of beliefs is typical of a peripheral belief.

In contrast, consider the belief that the Earth was stationary and at the center of the universe. In Aristotle's system of beliefs, this is a core belief. Importantly, this is a core belief *not* because of the depth of conviction Aristotle had in it, but rather because, like a puzzle piece near the center, it cannot be removed and replaced without dramatically altering the beliefs to which it is connected, which in turn would require altering almost his entire system of beliefs.

To illustrate this, suppose Aristotle tried to take his belief that the Earth was the center of the universe and replace it with, say, the belief that the sun was the center. Could Aristotle simply remove this belief, this piece of the puzzle, and replace it with a new belief that the sun is the center, and do so while still keeping most of the rest of the jigsaw puzzle intact?

The answer is no, because the new belief, that the sun is the center of the universe, would not fit into the rest of the jigsaw puzzle. For example, heavy objects clearly fall toward the center of the Earth. If the center of the Earth is not the center of the universe, then Aristotle's belief that heavy objects (those composed mainly of the heavy elements earth and water) have a natural tendency to move toward the center of the universe has to be replaced as well. This in turn requires replacing a multitude of other interconnected beliefs, such as the belief that objects have essential natures that cause them to behave as they do. In short, trying to replace just the one belief requires replacement of all the beliefs to which it is interconnected, and in general, it would require building an entirely new jigsaw puzzle of beliefs.

Again, this is all to reinforce the idea that Aristotle's beliefs were not a random, haphazard collection of beliefs, but were rather an interconnected, jigsaw puzzle-like system of beliefs. This notion that individual beliefs fit together to form an interlocking, consistent system of beliefs is the key idea behind the way I will use the notion of a worldview. In short, when I speak of a worldview, think of the jigsaw puzzle analogy.

The Aristotelian worldview

Thus far, we have primarily discussed Aristotle's own beliefs, and one might get the impression that a worldview involves a particular individual's jigsaw puzzle of beliefs. People do sometimes speak this way. There is a sense in which each of us has a somewhat different system of beliefs, a slightly different worldview, from everyone else. And our individual systems of beliefs, of course, are part of what makes us the individuals we are.

But a more important sense of "worldview," for this book, is a more generalized notion. For example, much of the western world, from the death of Aristotle to the 1600s, shared a more or less Aristotelian way of looking at the world. This certainly does not mean that everyone believed exactly what Aristotle did, or that the system of beliefs was not added to or modified during this period.

For example, at various times during this period, Judaic, Christian, and Islamic philosopher-theologians mixed Aristotelian beliefs with religious beliefs, and these sorts of mixtures illustrate some of the ways in which Aristotelian beliefs were modified in the centuries after his death. There were also groups who took a distinctly non-Aristotelian view of the universe. For example, there were groups whose beliefs were based more closely on the ideas of Plato (428–348 BCE) rather than Aristotle, and such Platonic-based belief systems provided an alternative to the Aristotelian worldview. (Plato, incidentally, was Aristotle's teacher, though Aristotle's views would eventually diverge substantially from those of Plato.)

In spite of such modifications to Aristotle's beliefs, and in spite of the existence of groups taking a non-Aristotelian view of the world, the belief systems of large segments of the western world, from about 300 BCE to about 1600, were very much in the Aristotelian spirit. The belief that the Earth was the center of the universe, that objects had essential natures and natural tendencies, that the sublunar region was a place of imperfection and the superlunar region a place of perfection, and so on, were part of the consensus of most of the western world. And these group beliefs fit together much like the beliefs of an individual fit together – into an interlocking, consistent, coherent system of beliefs. And it is this group jigsaw puzzle of beliefs, very much in the spirit of Aristotle's beliefs, that I will have in mind when I speak of the Aristotelian worldview.

The Newtonian Worldview

As an example to contrast with the Aristotelian worldview, let's look briefly at a different system of beliefs. Early in the 1600s, new evidence (largely from the newly invented telescope) arose that indicated the Earth moved about the sun. As discussed above, one cannot simply replace the Earth-centered piece of the Aristotelian jigsaw puzzle without replacing virtually all of the pieces of that puzzle. As such, the Aristotelian worldview was no longer viable. The story is fascinating and complex, and we will explore it more later in the book, but for now, suffice it to say that eventually a new system of beliefs emerged. And in particular, the new system was one that included a belief in a moving Earth.

Call the worldview that eventually replaced the Aristotelian worldview the *Newtonian worldview*. This worldview has as its foundation the work of Isaac Newton (1642–1727) and his contemporaries, but it has been added to considerably over the years. As with the Aristotelian view, the Newtonian worldview has associated with it a large number of beliefs. Here are some examples:

a) The Earth revolves on its axis, completing a revolution approximately every 24 hours.
b) The Earth and planets move in elliptical orbits around the sun.
c) There are slightly more than 100 basic elements in the universe.
d) Objects behave as they do largely because of the influence of external forces. (For example, gravity, which is why rocks fall.)
e) Objects such as planets and stars are composed of the same basic elements as objects on Earth.
f) The same laws that describe the behavior of objects on Earth (for example, that an object in motion tends to remain in motion) also apply to objects such as planets and stars.

And so on for the other thousands of beliefs that compose the Newtonian worldview.

This is the worldview that most of us in the western world have been raised on. And the exact same story applies to the beliefs that compose the Newtonian worldview as applies to the Aristotelian worldview. In particular, the Newtonian worldview comprises a system of beliefs that tie together as the pieces of a jigsaw puzzle tie together, forming a coherent, consistent, interlocking system of beliefs. While both systems of beliefs, the Aristotelian and the Newtonian, are coherent and consistent, they are very different jigsaw puzzles, with quite different core beliefs.

The change from the Aristotelian to the Newtonian worldview was a dramatic change, and much of the story of Part II of this book involves this transition. As we will see, this transition was spurred, in large part, by new discoveries in the early 1600s. Later, in Part III, we will explore some rather surprising recent discoveries. In something like the way the new discoveries in the 1600s required a change in the existing jigsaw puzzle of beliefs, so too the discoveries of recent decades require a change in our jigsaw puzzle of beliefs.

Concluding Remarks

Before concluding this introduction to the notion of worldviews, I want to make two quick observations. The first deals with the evidence we have for the beliefs that comprise our worldview, and the second concerns the apparent commonsense nature of many of the beliefs comprising our worldview.

Evidence

We have been speaking a great deal about beliefs, and presumably, people have reasons for holding the beliefs they do. That is, we would seem to have some sort of *evidence* for the beliefs we hold.

For example, presumably you believe Aristotle was wrong, and that the Earth is not the center of the universe. Instead, you most likely believe that the sun is the center of our solar system, and the Earth and other planets move around the sun. I suspect you have good evidence for this belief. But I also suspect that your evidence is not what you think it is. Pause for a few seconds and ask "Why do I believe the Earth moves around the sun? What is the evidence I have?" Seriously, put this book down for a few seconds and ponder these questions.

Ready? First, consider whether you have any direct evidence for your belief that the Earth moves around the sun. When I say "direct evidence," this is what I have in mind: when I ride my bicycle, I have direct evidence that I am moving. I feel the movement of the bike, I feel the wind in my face, I see myself moving past other objects, and so on. Do you have any direct evidence of this sort that the Earth is moving around the sun? It seems not. We do not feel like we are moving, nor do we feel constant high winds in our face. In fact, when you look out the window, it looks for all the world as if the Earth is stationary.

If you think about your reasons for your belief in a moving Earth, I think you will find you have no direct evidence – none at all – that the Earth is moving around the sun. Yet your belief is certainly a reasonable belief, and you certainly have some sort of evidence for it. But rather than direct evidence, the evidence you have is more like this: try for a moment to believe that the Earth does *not* move around the sun. Do you see that that belief does not fit in with your other beliefs? For example, the belief does not fit with your belief that your teachers, for the most part, have told you the truth. It does not fit with your belief that, for the most part, what you read in authoritative books is accurate. It does not fit with your belief that the experts in our society could not possibly be that wrong about something so basic. And so on.

The general point is that you believe the Earth moves around the sun largely because that belief fits in with the other pieces in your jigsaw puzzle of beliefs, and the opposite belief does not fit into that jigsaw puzzle. In other words, your evidence for that belief is closely tied with your jigsaw puzzle of beliefs, that is, with your worldview.

Incidentally, it would not be unreasonable to think that even if we ourselves do not have direct evidence that the Earth moves about the sun, surely experts in astronomy and related fields have such evidence. But as we will see in later chapters, even our experts do not have such direct evidence. This is not by any means to suggest that there is not good evidence that the Earth moves about the sun. There is good evidence. But that evidence is much more indirect than I think it is often assumed to be. And this is typical of many (probably most) of our beliefs.

In summary, we have direct evidence for a surprisingly small number of the beliefs we hold. For most of our beliefs (maybe almost all of them), we believe them largely because of the way they fit in with a large package of interconnecting beliefs. That is, we believe what we do largely because of the way our beliefs fit into our worldview.

Common sense

Most of us were raised with the Newtonian worldview, and most of the beliefs mentioned in connection with the Newtonian worldview seem almost like

common sense. But think about it a minute – such beliefs are anything but common sense. For example, it does not look as if the Earth moves around the sun. As mentioned above, if you look out the window, you will see that the Earth appears to be perfectly stationary. It also appears that the sun, stars, and planets move around the Earth approximately every 24 hours. And consider the belief that you likely learned at an earlier stage in your education, that objects in motion tend to remain in motion. Most people I know take this to be an obvious truth. But in our everyday experience, objects in motion do nothing of the sort. For example, thrown frisbees do not remain in motion. They soon hit the ground and stop. Thrown baseballs do not remain in motion. Even if they are not caught by someone else, they soon roll to a halt. In our everyday experience, *nothing* remains in motion.

My point is that, in general, the beliefs mentioned above as part of the Newtonian worldview, although most of us share those beliefs, are *not* the beliefs we arrive at by common sense or by common experience. But most of us were raised with the Newtonian worldview, and since these beliefs were taught to us from an early age, such beliefs now look to us to be the obviously correct beliefs. But think about it: if we had been raised with the Aristotelian worldview, then the Aristotelian beliefs would have seemed equally like common sense.

In short, from within the perspective of any worldview, the beliefs of that worldview will appear to be the obviously correct ones. So the fact that our basic beliefs seem to be correct, seem to be common sense, seem to be obviously right, is not particularly good evidence that those beliefs are correct.

This raises the following interesting issue: there is no doubt that the Aristotelian worldview turned out to be badly wrong. The Earth is not the center of the universe, objects do not behave the way they do because of internal "essential natures," and so on. Importantly, it is not just that the individual beliefs were wrong; rather, the jigsaw puzzle formed by that system of beliefs turned out to be the wrong *sort* of jigsaw puzzle. The universe, we now think, is not anything like the way it was conceptualized from within the Aristotelian worldview. Nonetheless, although wrong, those beliefs formed a consistent system of beliefs, and a system whose beliefs seemed, for almost 2,000 years, to be obviously right and commonsensical.

Might our jigsaw puzzle, our worldview, turn out to be equally incorrect, even though our system of beliefs is consistent and seems to us to be obviously correct and commonsensical? There is no doubt that some of our individual beliefs will turn out to be wrong. But the question I am asking is whether our entire way of looking at the world might turn out to be the wrong way of looking at the world, in something like the way the Aristotelian worldview turned out to be the wrong sort of jigsaw puzzle.

Or to put the same question another way: when we look at the Aristotelian worldview, many of the beliefs of that worldview strike us as quaint and curious. If we think about our descendants, say hundreds of years in the future – or even if we think about our grandchildren or great grandchildren – might our own beliefs, those that seem to you and me to be so obviously correct and commonsensical, look to them to be equally quaint and curious?

These are interesting questions. Toward the end of the book, we will explore some recent discoveries that suggest that some parts of our worldview might indeed turn out to be the wrong sort of way of looking at the world. But for now, we will leave these as questions to ponder, and move on to our next topic.