ABSTRACT

Dretske makes arguments in which he suggests three levels of the intentionality of knowledge: (1) a low level belonging to law-like causal relationships between physical properties, (2) a middle level defined in terms of the intensionality of sentences describing knowledge of these properties, and (3) a highest level of human cognition. Acknowledging the need to explain humans’ analytic knowledge, however, he proposes that we know a proposition P analytically when we know that P entails Q, even though P and Q are not identical.

I explore examples of deduction involving properties of every-day life, such as being a bachelor, being a stay-at-home mom, and being a consultant. I argue that to make these common sense inferences, the average person has to be aware of both analytical entailments and *propositional* entailments. While the former simply is knowing that if Emily is a stay-at-home mom, then Emily is female, for example, the latter requires us to be conscious of the (often complex) logical structure given to our beliefs by the deductive connectives AND, NOT, and OR.

From an empirical standpoint, there are two general possibilities for reductive accounts of these kinds of awareness. One would be a counterfactually defined set of causal criteria, such as Dretske’s. The other would involve statistical patterns of synaptic connections between neural phenomena, whose firings represent our concepts for AND, NOT, and OR. I argue that neither of these reductive explanations is viable; and that in order to explain the success of our inferences, we must appeal to two kinds of higher cognitive intentionality. First, we usually have some conscious awareness of analytical and propositional entailments when we engage in common sense-based deduction. Second, we often have a conscious intention to think deductively during these inferences, which drives our success.

I. Introduction

As thinking human beings, our common sense tells us that we often “know” things. This intuitive sense says that people often have states of mind that qualify as knowledge. Contemporary psychologists refer to these states as ‘cognitive states’; but from a philosophical standpoint, they are states of knowledge *that* P, where P is a proposition expressible in sentential form. A person can know that *5 X 5 = 25*, for example, that no right triangles are isosceles, that *some women are not Pennsylvanians*, or that *this child is one year old*. For philosophers of the mind, a person is in a state of knowing that *P* when his or her mind represents something, when it represents that thing accurately, or “truly,” and when this mental representation has a certain degree of logical or rational grounding. A state of knowledge that *the sun is shining*, for instance, occurs in my mind when three conditions are met: 1) my mind represents the sun, 2) my mind represents the sun accurately, i.e., as shining, and 3) I have some kind of rational basis for mentally representing the sun as shining.

Separate from this type of abstract or analytical reflection, our intuition also tells us about what it is to know something. It says that often, a particular state of knowing that *P* occurs in a person’s mind.**[[1]](#footnote-1)** One thing this means is that a cognitive state occurs one temporal point and endures to a distinct, subsequent temporal point. I may start believing that *the sun is shining* at 10 am on 08/07/2012, for example: and this belief may stop qualifying as a state of knowledge at 6:45 pm on 08/07/2012. (There are several reasons that the belief may later fail to be knowledge. At 6:45 pm, I may simply stop believing that *the sun is shining*, or it may stop being true that *the sun is shining*. Alternately, I may stop being justified in believing that *the sun is shining*, perhaps because I stop looking outside.

What else do we believe instinctively about our own knowledge? A given cognitive state, such as a rationally justified, true belief that *the sun is shining*, occurs as a *concrete* state of the mind of an *individual* person, namely, myself. That is, my “state” of knowledge that *the sun is shining* is a particular occurrence of this state in my mind only. On the one hand, we cannot deny that more than one person, in fact, hundreds of millions of people in the Western Hemisphere, may simultaneously know that *the sun is shining*. Yet, on the other hand, there is an important sense in which all of these people do not share this one *state* of mind, or hold it in common. This is because a numerically different, true, and rationally justified state of believing that *the sun is shining* occurs in the mind of each of these people. In fact, it is clear to us that while each of these mental states has a similar abstract logical structure, propositional form, and meaning, they are not numerically *identical* to each other. From this, our intuitions tell us that *my* state of believing that *the sun is shining* is a *concrete* state, just like yours. (In contrast, an *abstract* state would be one single mental state shared in common by both of our minds.)

As I mentioned above, philosophers believe that for a person to know that *P* is, in part, for his or her mind to *represent* something. They refer to this representative feature as ‘intentionality’. Philosophical theories of the mind often address questions about intentionality *per se*. That is, they are usually metaphysical or cognitive science theories about beliefs, which, of course, may be true or false. In contrast, Fred Dretske’s “The Intentionality of Cognitive States” addresses only the intentional features of states of *knowledge*, which, by definition, *must* be true.[[2]](#footnote-2) Dretske categorizes the intentionality of knowledge states into three distinct types. [[3]](#footnote-3)  The cognitive states of machines have a lower-order intentionality, which he defines completely in terms of law-like causal relationships. He proposes two higher levels of intentionality to explain the cognitive states of humans, which he characterizes in terms of knowledge of semantic content and analytical relationships.

According to Dretske, we can reduce most, if not all, intentionality to law-like *causal relationships*. Just as we have intuitions that tell us that we have states of knowledge and belief, other intuitions show us that things have causal relationships with each other. Ultimately, these instinctive beliefs we develop as toddlers make us think of causal relationships in terms of subjunctive conditional statements. A person working in a steel mill, for instance, may have an intuition that *the metal would not have expanded if the metal had not been heated*. His belief in this proposition depends upon his implicit assumption that there is a counterfactual relationship between the metallic property of having expanded and the thermodynamic property of having been heated. As his reflection becomes more abstract, he sees that this, relationship, in turn, implies the existence of a physical *law*, under which the heat *causes* the expansion.

Statements ascribing these law-like causal relationships are inten*s*ional, because the inference rule Substitution of Identicals can fail to preserve the truth of such sentences. In turn, this means that we can define intentional relationships in terms of these law-like causal relationships between properties. However, the low-level intentionality of machines is different from a higher, cognitive intentionality belonging to us as people. The latter is genuine knowledge, which accompanies human knowledge. It consists of our ability to distinguish between nomically related properties such as metal-heating and metal-expansion.

My primary objection to Dretske’s theory will be that it does not account for many cases in which a person clearly has knowledge. The examples he gives (in “The Intentionality of Cognitive States”) are all states of knowledge of empirical propositions, such as: *The pressure would not increase unless we were losing altitude*. Propositions like these concern law-like causal relationships between physical properties, like pressure-quantity and altitude. These causal laws reflect contingent laws of nature, not necessary laws of logic or mathematics. So, in the Kantian scheme of knowledge, they are *a posteriori* synthetic truths. This, of course, implies that they cannot be *a priori*. Dretske’s theory does not apply to many cases of knowledge because it cannot account for the intentionality of *analytic* knowledge.[[4]](#footnote-4) As a version of the Causal Theory of Representation, it is incapable of defining analytic knowledge reductively. Causal theories reduce intentionality to law-like (nomic) relations; but there is no way to define knowledge of analyticcontent in terms of these causal laws.

What is a state of knowledge, you might ask? From a philosophical perspective, a state of knowledge that *P* has three distinct properties: First, it is an intentional state, a belief that *P*. My occurrent belief that *the sun is shining* is an intentional state, for example. Next, it has the feature of being true, i.e., of being a belief that *the sun is shining* at a point in time when the sun actually *is* shining, as a matter of objective reality. My belief that *the sun is shining* is true in Bellevue, WA, for example, on 08/06/2012 at 2 pm PST. The final defining feature is having some kind of rational justification. It is highly rational forme to have the belief that *the sun is shining* at the time noted above, because I can see the sun shining at this time; and, according to common sense, this degree of rationality *justifies* this belief at that time.

The issue of what makes a mental state into *knowledge* has several facets. The first is: what makes a mental state a belief? That is, what makes a state *represent* something else? [[5]](#footnote-5) A separate one is: what metaphysical features make a belief that P *true*? Finally, what gives a true belief that *P* the *justification* to qualify as a state of *knowledge* that P? Note that I can address the first question independently of the last two. This means that one can as ask questions about the intentional features of cognitive states *independently* of questions in epistemology, i.e., the philosophy of knowledge, and independently of questions in the metaphysics of truth.[[6]](#footnote-6)

II. The Philosophical Issue of Intentionality

As mentioned earlier, cognitive intentionality is a property some mental states have, through which they represent things in a way that qualifies as knowledge. It would be natural for you, as the reader to wonder; what is this intentionality, itself? Just as it tells us that people often *know* things, our common sense also tells us that we have mental states that are *about* things — that is, our minds can *represent* other things. For instance, an idea of the flower on my coffee table can occur within my mind, and the mental state I am in while it is occurring represents, or is *about*, that particular flower. I can also think about (at least) the following: non-particulars, such as the class of plants in general; non-natural entities, such as the city of Philadelphia, abstract entities, such as mathematical equations; events or processes, such as World War II; characteristics, such as height; and states, such as economic recession. Moreover, I can have thoughts whose contents are *not true,* such as the belief that *Leonardo da Vinci painted an abstract work entitled ‘Orange and Yellow’*. Philosophers use the term ‘intentionality’ to refer to the property mental states have through which they represent things.

As you will certainly agree, human beings have powerful intuitions about how our beliefs relate to the world. These intuitions say that our beliefs have meanings that connect them to things in the world outside of the mind.[[7]](#footnote-7) Since these mental states *represent* things, we can evaluate them as being true or false. For example, if Susan says ‘I think that Bus 71B goes downtown’, our common sense guides us to interpret her to mean that that Susan is in a state of mind involving the idea that Bus 71B goes *downtown*, and that she internally affirms that idea. We can evaluate this state as true or false through the fact that it represents Bus 71B as having the property of traveling downtown.[[8]](#footnote-8)

From a more analytical or theoretical standpoint, Susan’s belief that *Bus 71B goes downtown* is an example of a propositional attitude. A propositional attitude is a belief, knowing, desire, fear, etc., that *P*, where *P* is a proposition expressible, in principle, in sentential form. One type of propositional attitude is a state of *knowing* that *P* — a state with cognitive intentionality. For example, a belief that *the square root of four is 1.5* is a propositional attitude. So is a belief that *the square root of four is two*, a fear that *I do not know the square root of three*, and a desire that *I calculate the square root of three*. Unlike the belief that *the square root of four is 1.5*, however, the belief that *the square root of four is two* is not only a belief, but also a state of *knowledge*. Neither my fear that *I do not know the square root of three*, nor my desire that *I calculate the square root of three* is a belief or a state of knowledge.

Beliefs, desires, etc., have contents; and philosophers distinguish between the intensional and extensional contents of propositional attitudes. The intensional content of the belief that *the square root of four is 1.5* is its internal, propositional meaning. This content has logical implications and a truth-value. One of its implications is that *1.5 multiplied by 1.6 is greater than four;* and its truth-value is FALSE. In contrast, the extensional content of the belief iswhat, if anything, the belief represents. In this case, it is an abstraction, namely, the number two. The belief is false, moreover, because it represents this square root inaccurately, i.e., as being 1.5. Analogously, a state of knowledge that *the square root of four is two* has an intensional content, namely, the “proposition,” or alternately, the “concept” that *the square root of 4 is 2*. This intension has a truth-value of TRUE (obviously); and it has many logical implications, such as the implication that *two multiplied by 1.5 is less than four*. The knowledge state has the same extension as the false belief state, namely, the abstract object that is the number 2.

When considering these background intuitive and analytical issues, it would be helpful for you to know that there is a historical philosophical debate between internalism and externalism. The debate concerns the *location*, so to speak, of whatever it is that provides a mental state with meaning or representative features. Internalists believe that something inside the mind gives an intentional state its semantic features and content. For example, consider again Susan’s belief that *Bus 71B goes downtown.* An internalist believes that something inside Susan’s mind, such as the occurrence of a *concept* of Bus 71B, makes this belief represent Bus 71B, makes it imply that it is false that *Bus 71B does not go downtown*, and makes it true. In contrast, externalism says that something outside of Susan’s mind gives this belief its semantic features and content. This is a relationship, usually a law-like *causal* relationship, between the occurrence of the belief her mind and something external to that mental state.

For example, it may be a law that when Bus 71B arrives in Susan’s presence, it causes the concept of Bus 71B to occur in her mind. The externalist believes that a more analytically and technically refined version of this causal relation is what makes her concept *represent* Bus 71B. Although it may be law-like, a *causal* relation between a mental state and something external to that state is always *contingent,* which means that it does not necessarily occur. (Obviously, the bus can arrive without making her think of it, since she can easily continue along with her pre-existing train of thought; and in doing so, simply *miss* the bus.) Therefore, causal theories imply that intentional states are only *extrinsically* semantic. That is, they only have meanings, logical implications, reference, and truth-values through their *contingent* relationships with other things. In what follows, these background ideas will help you understand Dretske’s view that causality explains knowledge.

III. Dretske’s Arguments for Reducing Intentionality to Causality

Just above, I mentioned Dretske’s view that (at least some) *intentional* properties, including those involved in human knowledge, can be reduced to *causal* properties.Atthis point, you might be wondering: what are his arguments for this? They are based upon his premise that in order to justify our beliefs in certain types of subjunctive conditionals, we must endorse propositions that imply law-like causal relationships between properties. These are the counterfactual propositions, such as *if the water had not been heated, the steam would not have arisen*, or *if the metal had not been heated, the metal would not have expanded*, that I mentioned earlier. Dretske holds that causal relationships can be reduced to these counterfactuals; and that these propositions imply *intensional* relationships between the properties of steam arising and of water being heated.[[9]](#footnote-9) That is, the presence of the former *represents* the latter, although we know the difference between these two features.

Having heard this, you may wonder: In exactly what sense does Dretske believe that we can reduce human knowledge to these kinds of causal relationships? Philosophers often define causal relations between events in terms of relations of *counterfactual dependence* between those events, as such:

If event x causes event y, then the occurrence of y counterfactually depends on the occurrence of x.

To begin understanding Dretske’s arguments, you may first want to consider this analysis of the relation whereby event x causes event y:

If x causes y, then this proposition is true: If x had not occurred, y would not have occurred.

What is the significance of this definition, you might ask? Consider this proposition: *if the water had not been heated, the steam would not have arisen*. This is a counterfactual conditional; and, the relationship it describes must be law-like, or “nomic.” In other words, in order for the heating event to effect the event in which steam begins to arise, there must be a general pattern that events of type x, such as heating water, cause events of type y, such as steam arising.[[10]](#footnote-10)

Yet, the truth of one or a few subjunctive conditionals, in which x and y refer to particular events, is not sufficient for a nomic relation between x and y. You can understand this caveat easily by thinking about a case in which *it is true that* if a particular quantity of water (w1) had not been heated, a particular occurrence (or quantity) of steam (s1) would not have been released. In this situation, the conditional *if w1 had not been heated, s1 would not have been released* is true, but it does not mean that there is a *law* that if water has not been heated, steam will not arise. Perhaps another event z1, such as an artificial separation of the H2O molecules in w1, would not have occurred if w1 had not been heated*.* In turn,ifevent z1 had not occurred, perhaps the steam would not have arisen.[[11]](#footnote-11) This thought-experiment reveals that we can only philosophically reduce causal relations to *law-like* counterfactuals, not to spurious or trivial ones.

1. Law-Like Causal Relations = Intensional Relations Between Properties

To lay out his argument that these causal relationships confer semantic relationships between properties, Dretske takes on a thought experiment, in which he considers the states of purely physical systems, such as galvanometers. This exercise leads him to conclude that these systems have a kind of *intentionality*. Moreover, he reveals his view that we can reduce this intentionality to law-like causal relationships; and he explains this analytical possibility by using the procedure of measuring electrical current with a galvanometer. This tool is “an instrument used to detect, measure, and determine the direction of small electric currents by means of mechanical effects produced by a current-carrying coil in a magnetic field.”[[12]](#footnote-12) It is designed so that its output, and hence, the internal states responsible for that output, depends, nomically, on the amount of electrical current flowing between points to which their probes are affixed. The relevant internal state is the amount of torque to which a pointer is affixed. With this example, he elucidates his idea that there is *representative* functionality in the law-like causal relationship between the *property* of having torque on the galvanometer needle and the *property* of having electric current flowing between two points.[[13]](#footnote-13)

According to Dretske, this purely physical state of the galvanometer has intentional content: it *represents* the presence and amount of current flow. However, this is a low-level, purely physical intentionality, which is distinct from high-level intentionality. The latter is genuine *knowledge*, which accompanies *human* cognitive states. He also thinks that we can understand the existence and character of these different levels of intentionality by considering the *intensionality* of the information the galvanometer relays. The presence (and amount) of torque on a galvanometer’s meter constitutes (or expresses) information, namely, the existence (and degree) of current flowing. This is because the sense in which a state of its needle having torque has an *inten****s****ional* relationship with the property of flowing electric current.

At this point, you may wonder: What exactly is this philosophical notion of intensionality, as opposed to the representative feature of intentionality? Dretske bases one argument on the premise that unlike a galvanometer, a *human* may learn that (a certain amount of) electric current is going from point A to point B by observing the direction (or amount) of torque on its needle. The sense of ‘learning’ here is that in which we learn information from statements of the form ‘a=b’, In contrast, we do *not* learn information from statements of the form ‘a=a’. Obviously, this entails that a human can *know* that *a=a* without knowing that *a=b*, even if the terms ‘a’ and ‘b’ refer to one and the same object. This knowledge gap is possible, in turn, because the terms ‘a’ and ‘b’ may have different *intensional* contents, even though they are extensionally identical. In this sense, we can reduce the *intensional* relationship between the properties of current flow and needle torque to a law-like *causa*l relation between them.

Another way to understand this line of reasoning is to consider an intensional *sentence* of the form ‘person x knows that *a=b*’. This kind of sentence ascribes a state of cognitive intentionality, a state of knowledge to a person. For example, imagine that Oedipus knows that *Jocasta = Jocasta*; and therefore, it is trivial that this sentence is true:

‘Oedipus knows that Jocasta = Jocasta.’ (Sentence A)

However, Oedipus does *not* know that Jocasta is Oedipus’ mother ( or that the terms ‘Jocasta’ and ‘Oedipus’ mother’ refer to the same object). Assume, then, that one substitutes the term ‘Oedipus’ mother’ for the term ‘Jocasta’ in sentence A. The result is this sentence:

‘Oedipus knows that Jocasta = Oedipus’ mother’. (Sentence B)

At this point, you might feel the need to ask: how do we *know* that these sentences have intensional content; and what is the significance of this “intensionality,” anyway? Here is a definition that should help: A sentence has intensional content if and only if applying the deductive rule Substitution of Identicals (SI) to this sentence may fail to preserve the truth of the sentence. Despite the fact that the terms ‘Jocasta’ and ‘Oedipus’ mother’ refer to the same object, the substitution of the term ‘Oedipus’ mother’ for the term ‘Jocasta’ in sentence A did not preserve the truth of sentence A. For while sentence A, which is of the form ‘a=a’, is logically true, sentence B, which results directly from a substitution by SI, is clearly false.

To continue exploring ‘intensionality,’ note that my application of the SI rule to a true sentence, A, has resulted in a *false* sentence. So, when applied to a sentence *ascribing a cognitive state to a person*, SI may fail to preserve the truth of this very sentence. The reason for this inferential failure, as you can see, is that human beings can distinguish between propositions that refer to the same object, but have different intensional contents: *Jocasta = Jocasta*, and *Jocasta = Oedipus’ mother*. This is the sense in which a sentence ascribing a cognitive state to a human being is one with “intensional” content.

2. Intensional Sentences about Knowledge States = States of Cognitive Intentionality

What I have discussed so far should make two things clear to you about Dretske’s reductive analysis of intentionality. First, he believes in a law-like causal relationship between the amount of torque on a galvanometer’s needle and the amount of current flowing between two points. Second, this nomic relationship confers an *intensional* relationship upon these properties. So far, I have answered the first questions I intended to address, namely, how do we *know* that a sentence has intensional content and what is the property of intensionality? Yet, you might wonder: what is the significance of this cogno-semantic feature? As mentioned, Dretske defines the intentionality of human knowledge in terms of intensional sentences about a person’s thoughts. To understand this distinction, you may want to consider these sentences:

Eric knows *that there is amount a1 of torque on needle n*.

*Eric* knows that *there is amount a2 of electric current flowing from point A to point B*.

Just as with Oedipus’s beliefs, the SI rule could fail to preserve the truth of sentence 1. As you can see, *Eric* may know that there is an amount of torque on the needle without *knowing* that an amount of current is flowing between A and B. Unlike the galvanometer, therefore, *Eric* *can* distinguish between the intensional contents of sentences 1 and 2. This is because as a conscious, thinking person, he can distinguish between these propositions:

There is torque on needle n (in quantity q1).

There is current flowing from point A to point B (in quantity q2).

What does this mean? Sentences 1 and 2 are intensional. While being *extensionally* identical to the galvanometer, they are *intensionally* different from *Eric*’s point of view. It also means, according to Dretske, that the *properties* of having torque on a needle and having current flowing from A to B are *intensionally* related.

Remember that the galvanometer cannot distinguish between propositions 3 and 4 above. Yet, people do *learn* that there is current flowing from A to B by learning that there is torque on its needle. Dretske thinks this shows that the internal state of the galvanometer represents the existence and amount of current flowing from A to B. The states of this instrument *are* intentional, but only on a low level, a level that fails to qualify as *knowledge*. Unlike you or me, the machine cannot distinguish the information above. This is the sense in which the machine only has physical intentionality, while Eric has a higher, cognitive intentionality. He implicitly understands that a certain amount of torque on the meter means something different from a certain amount of current flowing from point A to point B.

What does this imply about the difference between this intentionality and that of a machine? As he says, “If galvanometers occupy intentional states, the conclusion to be drawn is not that galvanometers know things, but that knowledge is not simply a matter of occupying an intentional state, a state with a content corresponding to what is known when something is known.”[[14]](#footnote-14) In what follows, I will explain my objections to this view of human knowledge.

IV. Human Analytic Knowledge as an Objection to Dretske’s View of Intentionality

My primary objection to Dretske’s Causal View is that in principle, it cannot explain *a priori* or analytic knowledge. I base my first argument for this upon on textual evidence: all Dretske’s examples are states of knowledge of *empirical* propositions. These are *a posteriori* synthetic judgments in Kant’s epistemological schema.**[[15]](#footnote-15)**  You might remember that Kant held that knowledge states with propositional content, such as knowing that *5 X 5 = 25*, or that *all objects are heavy*, are judgments.**[[16]](#footnote-16)** From this perspective, states of knowing that *the sun is shining*, or that *the metal would not have expanded unless it was heated,* are judgments. In particular, these latter two knowledge states are *a posteriori* judgments.

To review why these judgments are *a posteriori*, I will discuss them in comparison to *a priori* judgments. Knowledge is *a priori* if it is “independent of experience and even of all impressions of the senses.”[[17]](#footnote-17) In order to justify the judgment that *5 X 5 = 25*, for instance, we need not appeal to particular facts that someone has verified through experience or observation. This means that a person who makes the judgment that *5 X 5 = 25* has *a priori* knowledge. Instead of having to investigate the number 5 using his sense experience, a person only has to use his faculty for deductive, arithmetical reasoning to arrive at this judgment. To know that *all objects are heavy*, or that *electrical current is flowing between point A and point B*, in contrast, he must use sense experience (or rely upon that of others). Thus, in contrast to my example of knowing that *5 X 5 is 25*, Dretske’s examples of knowledge are *a posteriori* judgments.

It is important that latter kinds of judgments are also synthetic. Dretske refers to the mental states he intends to describe with the following: “I mean to discuss those mental states whose expression calls for a factive nominal, a that-clause, as complement to the verb….”[[18]](#footnote-18) He is also speaking of our knowledge of concrete and specific things because the actual examples he gives of knowledge states are all empirical. In addition to simple states, such as Eric’s knowing *that there is amount a1 of torque on needle n*, he gives more complicated examples of knowing about law-like relationships between physical properties:

* The metal would not have expanded unless it was heated.
* If the capacitator had discharged, it would have moved the galvanometer needle.
* The pressure would not increase unless we were losing altitude.

It should be clear to you that these propositions are manifestations of *natural* laws,[[19]](#footnote-19) not of logic or mathematics. These rules are empirical; and so knowledge of propositions involving law-like physical relationships is *empirical*. We can also be sure that this knowledge is synthetic, since we can only justify it through evidence based in our observations.**[[20]](#footnote-20)**

If you notice, most of Dretske’s examples also fall under the Kantian category of *singular* judgments, which are about individual objects, and which, therefore, cannot be *a priori*.[[21]](#footnote-21) Judgments in general may be universal, particular, or singular. A belief that *all objects are heavy* is a universal judgment; and a belief that *some women are not Pennsylvanians* is a particular judgment, for example. Singular judgments, in contrast, take the following forms:

* x is G,
* The F is G, and
* This F is G. [[22]](#footnote-22)

Below, you can see that Dretske’s examples are singular judgments, such as:

* Knowing that there is current flow between point A and point B,
* Knowing that [a particular non-solid quantity] is an acid,
* Knowing that the metal would not have expanded unless it was heated, and
* Knowing that the blonde is angry.

What do these cases demonstrate? They show us that singular judgments always concern individual objects, such as “the metal,” “the blonde,” and so on. Since our knowledge of individual things arises from our experiences, most singular judgments cannot be *a priori* knowledge.[[23]](#footnote-23) I argue that as it stands, Dretske’s theory cannot account for the cognitive intentionality of *analytic* knowledge either. Yet, my objection does not depend upon the types of examples he uses. Rather, as a version of the Causal Theory of Representation, Dretske’s view is *intrinsically* incapable of defining analytic knowledge reductively.

To understand my argument, it is important for you to know that causal theories reduce intentionality to law-like (nomic) causal relations in two general ways. One view defines the intentionality of an individual concept in terms of its exclusive causal relationship with a class of objects.[[24]](#footnote-24) I call this the ‘Individual Counterfactual Concept’ (ICC) account. The concept COW, for example, represents cows and cows only in virtue of the fact that cows normally cause the concept COW to occur in a person’s mind. In particular, the occurrence of the concept COW must be counterfactually dependent upon occurrences of actual cows. The following subjunctive conditional expresses this causal dependence relation:

* (C) If cows had not occurred, the concept COW would not have occurred.[[25]](#footnote-25)

It is important to note that this counterfactual dependence must also be *asymmetrical:* To understand this requirement, you should consider the possibility that it is *also* true that:

* (H) If horses had not occurred, the concept COW would not have occurred.

Under these highly plausible circumstances, the asymmetry requirement ensures that the concept COW represents cows exclusively, and *not* horses. Yet, *how* does it do this, you may ask? The condition means that the law-like causal relationship between cows and the concept COW is *independent* of, and therefore has priority over, the causal relationship between horses and the concept COW. By now, you can gather that this is the sense in which cows are the actual *cause* of the concept COW, while horses are *no*t.

So far, I have been discussing the ICC version of the Causal Theory of Intentionality. Now, I will address the second version, which includes Dretske’s view of human knowledge. He defines cognitive intentionality in terms of a complex, law-like causal relation between properties. Two properties (or events) F1 and F2 bear this relationship under these conditions:

* There is a counterfactually-based causal relation between two properties (or events), such that: If property (or event) F1 had not occurred, property (or event) F2 would not have occurred.
* This causal dependence must be nomic, or law-like. (It must be a law that: if F1 had not occurred, F2 would not have occurred.)
* A sentence ascribing this nomic relation between F1 and F2 is *intensional*.

How can a mental state meet these criteria? To find an answer, let us revisit the galvanometer example. A person, but not a galvanometer, can distinguish between the proposition *there is torque on mobile armature m* and the proposition *there is current flowing from point A to point B*. If see meets all of the above conditions, a person can know that i*f the flowing of x amount electric current between A and B had not occurred, the appearance of x amount of torque on the galvanometer would not have occurred*. Under these conditions, a person knows that a certain amount of torque on the galvanometer represents a certain amount of flowing electric current, although they are not the same feature.

What else can we gather about Dretske’s view? On the one hand, it would account for the intentionality of a person’s knowledge that *a certain amount of current is going from point A to B*. On the other hand, I object that we *cannot* reduce knowledge of analytic propositions to this type of causal property, because the second condition implies that the law guaranteeing the causal relation between the two properties is *empirical*. The law says that if physical property F1 had not occurred, physical property F2 would not have occurred, in other words. Yet, a physical, causal relationship — such as that which obtains between a needle and electric current flowing between two points — is *always* contingent. There is no logical, mathematical, or analytical rule making it *necessary* that a needle’s torque varies with any degree (or occurrence) of electric current flow. A nomic relation between the two properties is, therefore, an empirical relationship.

From this, you can see why I conclude that we cannot reduce a person’s knowledge of a logical, mathematical, or analytical proposition to his understanding of this type of law-like causal relationship. Therefore, neither can we reduce his ability to distinguish between analytically related contents to his ability to distinguish between nomically related contents. Take being a bachelor and being male, for instance. The fact that a person named ‘Eric’ instantiates the property of being a bachelor implies that he instantiates being male. Yet a child named Mark can be male without being a bachelor, so they are different properties.

You may also notice the divergence between logical and nomic (or law-like *causal* relationships). Being a bachelor and being a male are analytically, but not *causally* related. Thus, there can be no causally based law-like relationship between them. From this, you can now see that we cannot reduce our common sense-based understanding of the distinction between the properties being a bachelor and being male to a law-like causal relationship.

V. A Counter-Objection: Dretske’s Proposal for Analytic Knowledge

Dretske acknowledges directly addresses knowledge of *analytic* content, when he says:

To construct an adequate model of cognitive content, we need structures that can distinguish not only between nomically related situations but between analytically (or if you do not like that word, logically) related contents. Since knowing that P can be distinguished from knowing that Q even when P entails Q (sometimes at least), the problem is to develop the above analysis of cognitive content in such a way as to reflect this higher grade of intentionality.[[26]](#footnote-26)

As is clear to you by now, Dretske has distinguished between low-level, physical intentionality and a higher, *cognitive* intentionality. Nonetheless, he insists, “knowledge is not simply a matter of occupying an intentional state, a state with a content corresponding to what is known when something is known.” [[27]](#footnote-27) It is not enough that the amount of torque on a needle varies proportionately with the amount of current flowing between two points, because this co-variation does not constitute the needle “knowing” how much current is flowing. Rather, a state of knowledge must also have *cognitive* intentionality, which he now defines in these ways:

* In terms of whether a sentence ascribing the state to an entity is intensional.
* In terms of the ability of an artificial model to distinguish between nomically related situations.

What does this mean? Accounting for *analytic* knowledge requires a third level of intentionality, which he defines in two ways:

* In terms of the ability of the artificial model to distinguish between analytically related contents.
* In terms of developing “the above” analysis of cognitive content so that it reflects the higher grade of intentionality.

Having considered this definition, it might be good to remember that a person’s knowledge of any analytic proposition must be *a priori*. Therefore, we can at least consider Dretske’s proposal for addressing analytic content as a sketch of a response to a specific charge: that his model of cognitive intentionality does not address the intentionality of *a priori* knowledge.

According to Kant, all judgments have subject and predicate concepts. For instance, the subject concept of the judgment that *all objects are heavy* is the concept of a physical object, while the predicate concept is the concept of weight.[[28]](#footnote-28) A subject concept can bear two kinds of relationships toward its predicate concept, moreover, which determines whether judgments involving these concepts are analytic or synthetic.

1. Analytic Knowledge and Judgments

Now, we should review how subjects and predicates are related to analytic knowledge. A judgment is analytic, according to Kant, if its predicate concept belongs to (or is contained by) its subject concept. If you merely analyze the concept of a bachelor, for example, you will arrive at the conclusion that anyone who is a bachelor must be a male. Of course, this is because the concept of a bachelor *is* the concept of an unmarried, adult male. No one needs actual experience of bachelors being male is order to learn that any bachelor must be a male. You do not need to go outside, observe many bachelors, and test their chromosomal structure to learn that they all are male. This is the sense in which the subject concept of the judgment that *all bachelors are male*, i.e., the concept of a bachelor, contains the predicate concept – the concept of a male. Therefore, the judgment that *all bachelors are male* is *a priori* analytic. [[29]](#footnote-29)

A judgment is synthetic, in contrast, if its subject concept does not contain its predicate concept. To see this, you can consider the judgment that *some women are not New Yorkers*. Unlike the case of thinking about bachelors, when someone makes this judgment, she does not arrive at the concept of not being a New Yorker simply by analyzing the concept of being a woman. So, in this basic sense, we know that this is not an analytic judgment, but how do we define what it is to be a synthetic judgment? Kant provides us with a quite helpful test. To verify a synthetic judgment, a person must appeal to something outside its subject concept, which, in many cases, is experience. For example, my experience tells me that some women are from Connecticut, from Pennsylvania, etc.; which verifies that *some women are not New Yorkers*.

At this point, you can be certain that there are no *a posteriori* analytic propositions; and that our knowledge of analytic content must be justified *a priori*. Yet, why must a theory of cognition account this knowledge in the first place? Consider these examples:

* Susan knows that *5 X 5 = 25*.
* Susan knows that all bachelors are male.
* Susan knows that if every parent is either a father or a mother, and Eric is a parent but not a mother, then Eric is a father.

In contrast, consider these *a priori* synthetic judgments:

* Susan knows that no triangles are quadrilateral.
* Susan knows that *a2 + b2 = c2*.

In addition, these *a posteriori* synthetic judgments:

* Susan knows that all bodies are heavy.
* Susan knows that some women are not native Pennsylvanians.
* Susan knows that Mark is one year old.

Clearly, the *a priori* analytic judgments above manifest basic logical, mathematical, and conceptual principles, such as *all stay-at-home moms are female*, and *5 X 5 = 25*. These kinds of intuitive principles are the foundation of any type of deductive reasoning. We cannot say that a person who cannot understand that *5 X 5 = 25*, for example, or that *all stay-at-home moms are female*, has an adult’s level of rational justification for his beliefs. This means that neither can we say that he has states of knowledge. Under the assumption that we should use reasoning to acquire and to justify our knowledge, therefore, you can see that any philosophical theory of knowledge must account for the content of these types of states.

2. Dretske’s Criteria for Analytic Knowledge

To understand Dretske’s response to the critique that he has not addressed analytic knowledge adequately, you might want to consider the example he uses to explain his idea of a third-tier of cognitive intentionality. He suggests that a system (or an artificial model) has analytic knowledge of proposition P if there are times when we can distinguish its knowing that P from its knowing that Q — even when P entails Q. Since Dretske’s view is a causal theory of the intentionality of knowledge, the question(s) we must ask are:

1. Under what *causal* conditions can we distinguish between the following states, as they belong to a human, an artificial system, such as a model or physical machine?
   * Knowing that *P*, and
   * Knowing that *Q*.
2. Would the satisfaction of these *causal* conditions prove that the human, the model, or the machine has analytic knowledge of P?

One thing we can be sure of when beginning to consider these criteria is that any artificial model of knowledge should be syntactically, and thus, *formally* describable. So, I can feel comfortable assigning some kind of formal content to these states, by assuming that:

* P is a proposition of the form ((A OR B) & ((NOTB) OR C)), where OR is inclusive, and
* Q is a proposition of the form (A OR C); where the if-then relationship is a material conditional, and thus, by assuming that:
* P entails Q, I assume that((A OR B) & ((NOTB) OR C)) entails (A OR C)

What I have created are are deductively structured propositions P and Q, which can be either analytical or synthetic judgments. Note that while P entails Q, Q does not entail P.[[30]](#footnote-30) This reflects the meaning of Dretske’s reference to analytic knowledge as belonging to situations in which: “knowing that P can be distinguished from knowing that Q even when P entails Q (sometimes at least).”[[31]](#footnote-31) Now, we must address another question: under what causal conditions could we distinguish between these two states of an artificial system:

* Knowing that P, and
* Knowing that Q?

In principle, we could say that a syntactically driven or computational system knows that *A OR B* in virtue of the fact that states of the system have certain types of causal relationships with each other. In the same way, we could say that this system knows that *if* A OR B is true, *then* (If NOT A, then B) is true*.* The causal relationship that allows us to say that this system has this knowledge must be law-like, or *nomic*; and as we have seen, Dretske’s theory *reduces* the intentionality of such knowledge states to these nomic relations. Despite his goal of reducing knowledge to causal relationships, Dretske also wants to define his third level of intentionality in terms of our *human* knowledge that P entails Q, even though they (P and Q) are not identical.

As the reader, it may be important for you to note that P and Q are *empirical* propositions. If we are to develop Dretske’s account of artificial systems’ analytic knowledge into an account appropriate for human beings, then we must apply his criteria to the kinds of common sense-based and deductively structured beliefs held by us, as *people*. Since it is impossible to have *a priori*, analytic knowledge of an empirical proposition, the causal conditions we seek must imply some other kind of analytic knowledge**.** In other words, we are looking for a Dretskean causal relationship between P and Q that explains the fact that a *person* knows that P entails Q while understanding that P and Q are distinct propositions. This would have to be analytic knowledge of the *entailment* relationship between P and Q, which (indirectly) includes knowledge that while P 🡪 Q, Q does not entail P.

To see my reasoning, consider that proposition P, such as *Eric is a bachelor*, has an analytic relationship with proposition Q, namely, *Eric is male*. Yet, the two propositions are not the same: P implies Q, while Q does not imply P. Analogously, proposition P1, such as *Susan is a stay-at-home mom*, has this same kind of analytical relationship with proposition Q1, namely, *Susan is female*. Dretske appears to have a point that the highest level of cognitive intentionality, as it applies to analytic relationships between propositions, involves a human’s awareness of such entailment relationships *without* this person’s believing that the propositions are the same. But, as the reader, you may ask: what is it exactly to “know” that the propositions *Eric is a bachelor* and *Eric is male* are not the same, although the former implies the latter? My answer is this: it is simply *knowing* that in order to be a bachelor, Eric must be male, but that he also must be two *other* things, namely, unmarried and an adult, which a male need not be.

On the one hand, there is no causal relationship between these properties. Therefore, Dretske cannot explain how *people* have this kind of *conceptual* knowledge in terms of such a causal connection. Nonetheless, an artificial system can have state-state transformation patterns that *mimic* such knowledge. It can have a pattern whereby a state that symbolizes *Susan is a stay-at-home mom*, for example, often transforms to a state that symbolizes *Susan is female*. The system can also have patterns in which it never transforms to a state that symbolizes *Susan is male* or that *Susan is a corporate executive*.

From this, you can see how the causal relationships between these computational states could, theoretically, mimic the analytical entailment relationships between the propositions *Susan is a stay-at-home mom and* *Susan is female*. However, these functional patterns do not make it the case that the system has “knowledge” of these entailment relationships, since they do not explain how the system would know that *Susan is a stay-at-home mom* and *Susan is female* are not identical. Clearly, they would simply amount to mimicry of the knowledge of the human who programmed these patterns into the artificial agent. This is the sense in which human knowledge is not completely reducible to causal relationships.

But, what of Dretske’s prospects for reductively defining these entailment relationships into a primitive causal relationship, you might ask? Clearly, there is no law-like causal condition between being a bachelor and being male, or between being a stay-at-home *mom* and being female. Therefore, no law-like pattern of causal relationships between these properties would explains why a human would understand that being a bachelor entails being male, despite the fact that they are not identical properties. This shows that we cannot appeal to the first two criteria of Dretske’s theory of cognitive intentionality to explain human analytic knowledge of common sense properties such as of being a bachelor or a stay-at-home mom.

Nonetheless, I could try to use a variant of his third *criterion* for intentionality: Perhaps we have knowledge when a sentence describing the law-like relationship between two properties humans have knowledge of, e.g., being a stay-at-home mom *and* being a female, is intensional. I cannot reduce this cogno-linguistic property to a causal relationship between human mental states: the truth of one sentence does not the truth of the other; and neither do the knowledge states to which they refer cause each other. So, I cannot reduce our human knowledge that *Susan is a stay-at-home mom* entails that she *i*s femaleto a causal relation.

So far, what have we learned? Since Dretske defines a successful explanation as reducing such knowledge to law-like *causal* relationships, it fails. Perhaps I can look more deeply at our knowledge of analytical entailment relationships for an answer.

VI. Higher Intentionality and Consciousness of Entailment Relationships

What is this idea of higher-level, *cognitive* intentionality? As Dretske suggests, it is a *conscious awareness* of entailment relationships between propositions. Analytically or semantically related atomic propositions, such as *Eric is a bachelor* and *Eric is male*, can bear these relationships toward each other. Alternatively, the relationships can hold between complex, deductively related propositions, such as *Jane is a consultant and Jane is a New Yorker*, on the one hand, and *it is not true that Jane is not a consultant or Jane is not a New Yorker,* on the other. As the reader, you may want to notice that these logical relationships are governed by first-order deductive connectives such as AND, NOT, and OR.

Along with our common sense, there are philosophical reasons for believing that we have this knowledge; and that it is an essential part of our minds’ representations of the world. Every day, we make these kinds of deductive inferences involving abstract properties of common sense. You might infer that *Jane is not a stay-at-home mom* because she is a corporate executive, for example, or that she is not a consultant because she *is* a corporate executive. When thinking something like this through, you are consciously aware of the entailment relationships between the propositions involved in your reasoning process. Yet, I will argue, we cannot reduce this awareness to law-like causal relationships or to statistical patterns of neural excitations and connections.

Imagine that Susan infers *Eric is male* from her assumption that *Eric is a bachelor*. This is a deductive reasoning process involving abstract properties of common sense, such as being a bachelor, being male, etc. It is safe to assume that at some point, Susan is consciously aware of the entailment relationships between propositions such as *Eric is a bachelor* and *Eric is male.* How might this train of thought play out? The first state to occur might be her conscious awareness that *being a bachelor involves being an adult, unmarried, male*. Next, could be her *pre-conscious* awareness of the inconsistency in the assumption that *Eric is a bachelor and Eric is not male*. Her instinct to reject of contradictory propositions should follow this awareness. I also think her rejection would be based in an aversion to believing propositions that are (formally or informally) contradictory, such as *Eric is a bachelor and Eric is not male*. After pre-consciously rejecting the inconsistency, perhaps she would be *consciously* aware that the inconsistent implication cannot be true; which, finally, would cause her to *believe* that *Eric is male*.

In some cases, she might also have a conscious intention[[32]](#footnote-32) to think rationally during, or to apply formal deductive reasoning principles to, her thought process about Eric. This intention would cause her to reject her original, hypothetical assumption that *it is not true that Eric is male*, and thereby to affirm the conclusion that *Eric is male*. Yet it is not clear that such a deductive intention is needed in *all* cases of analytic knowledge.

Having thought about my example, you can consider the philosophical question. Why would certain kinds of human reasoning require higher cognitive intentionality (or knowledge of entailment relationships between propositions)? Why would we *not* be able to reduce the states of knowledge in Susan’s inference to law-like causal relationships between properties? For that matter, why could we not reduce them to statistical patterns of the neural excitations and connections that underlie her thoughts?

To look for an answer, imagine how the average person might use concepts for two first-order deductive connectives, namely, AND and NOT, which govern logical relationships between propositions. Complex propositions involving them have the form of (P AND Q) or NOT (P). The belief that *Susan is a stay-at-home mom* AND *Susan is female*, for example, has the form P AND Q, as does the more complex *Jane is a consultant or Jane is a stay-at-home mom* AND *Eric is a bachelor*, which has the form((A OR B) AND C). Lastly, I can make any proposition into a negation by attaching the deductive connective NOT to it. You can see this with *it is not true that Eric is a bachelor* (NOT (C)), or *it is not true that Jane is a consultant or Jane is a stay-at-home mom* (NOT (A OR B)).

I will argue that Susan would need deductive awareness to accompany her neurons for NOT and AND under different conditions. In my view, these disparate criteria allow these neurons to play their proper logico-semantic roles. When Susan uses the connective NOT in a simple deductive inference,[[33]](#footnote-33) she needs some type of awareness of the contradictory implications of a proposition. This proposition, in turn, would be the opposite of that to which she attaches the NOT. For example, when she thinks *it is not true that Eric is a bachelor AND Eric is not male*, it is due to some kind of awareness she has that her belief that *Eric is a bachelor* is inconsistent with the hypothetical proposition *Eric is not male*. This consciousness is her knowledge of the analytical entailment relationship between *Eric is a bachelor* and *Eric is male*. To carry out this argument, I will assume that in each mental state of her reasoning process, the firing of one neuron represents her belief in the truth of one proposition governed by a connective, such as AND, NOT, or OR.[[34]](#footnote-34)

1. The Binary Valued Neurons for Deductive Connectives

For philosophical reasons and for the purposes of explanatory simplicity, I use simple binary arithmetic to model Susan’s thought processes. Specifically, I use individual neurons to represent each individual belief she has in a deductively structured proposition, such as *Eric is a bachelor* AND *Eric is male*. What quantitative values do I assign this neuron, you might wonder? The binary values 1 and 0 represent the truth (or falsity) of the deductive connective(s) in her belief, such as AND, NOT, and OR. In this way, I have a truth-functional (semantic) model of her belief, according to which she believes a proposition is true *just in case*:

1. The binary value of the “model” neuron supporting this belief is 1, and
2. The primary deductive connective of the proposition (or belief) is true.

For example, *Eric is a bachelor AND Eric is male* is true just in case both its component propositions, i.e., *Eric is a bachelor* and *Eric is male,* are true. From a truth-functional standpoint, this means the whole complex proposition has the form P AND Q; and its primary deductive connective, namely, AND, is true just in case both of its component propositions, P and Q, are true. Appropriately, I assign a binary value of 1 to a “model neuron” whose firing represents Susan’s belief in the complex proposition P AND Q.

I also assign a binary value of 1 to one neuron for each of the component propositions of Susan’s belief in P AND Q. namely, *Eric is a bachelor* (P) and *Eric is male* (Q). Of course, this symbolizes that she believes that *Eric is a bachelor* and that she believes that *Eric is male*. Finally, each of these neurons (the one for P and the one for Q) must each establish its own excitatory synaptic connection with Susan’s “model” neuron for AND. If one of these neurons, such as the one for her belief that *Eric is male* (Q), does *not* fire, then it has a value of 0. This neural value represents that she does *not* believe that *Eric is male*; and as such, it represents that she does not believe that *Eric is a bachelor AND Eric is male.*

At this point, you might object quite strongly to my primitive thought-experiment. For in reality, you have a right to insist, almost all cognitive processes involve (at least) thousands of neurons and synaptic connections. So, they involve extremely complex mathematical relationships, the modeling of which poses difficulty for even the most sophisticated computational methods. To represent human reasoning processes with accurately, I would need more than a few binary values of 1 or 0, more than one “model” neuron, and more than a few pre-synaptic neurons for each deductively structured belief. However, I only aim to establish a schema of the most primitive causal relationships between beliefs, namely, that one belief comes after another one; and to model their truth-functional relationships through individual binary values. In this way, I only *mimic* the *logical* structure of the average person’s reasoning involving first-order connectives AND, NOT, and OR. I do not represent the complex factual reality of the cellular processes.

Having understood this, let us return to Susan deciding that *Eric is male* because he is a bachelor. I suggested earlier that in order for her to recognize the contradictory implications of believing that he is *not* male, she needs a certain higher-order intentional feature. That is, deductive awareness must accompany her neurons for NOT and AND during this reasoning process. You may want to ask: why does she *need* this kind of deductive awareness? Consider the hypothesis that *Eric is a bachelor AND Eric is not male*. Susan would only consciously believe that this is *not* true if she has *already entertained* this proposition (in some sense) and has recognized its inconsistency (at some level). Obviously, then, some type of internal awareness must induce her to reject it. This deductive knowledge is what would cause her to believe in the negation of *Eric is not male*, namely, that *it is not true that he is not male*.[[35]](#footnote-35)

2. Higher Intentionality and the Deductive Connective AND

In contrast to this kind of situation involving involving her concept of NOT, none of the most simple cases in which Susan would use AND require this conscious awareness of deductive propositional entailments. As I explained earlier, when Susan infers that since *Emily is a stay-at-home mom and* *Emily is a female*, Emily must be a stay-at-home mom, she does not need a conscious *intention* to think deductively about Emily. This is because she is just repeating a component belief that Q after believing that P AND Q. Nor does she need conscious awareness of the deductive entailment relationship between propositions of the form P AND Q and simple propositions of the form P.

In more complex cases, however, Susan *would* need conscious deductive reasoning in order to employ her concept of AND. These cases involve inferential patterns such as *Eric is a bachelor*, thus *Eric is a bachelor and Eric is male.* You can explore these patterns through the inference rules that they manifest in her mind. Here are several simple inference rules involving:

1. P, Q, therefore P & Q,

2. P & Q therefore P, and

3. P & Q, therefore Q.

As you may remember, one of my goals was to discuss whether synaptic weights and repetitive connection histories explain these reasoning processes adequately. This could be a reductionist causal view; for ultimately, the weight of a synaptic connection would *cause* one state to bring about another in an analytical inference. Consider a synaptic weight powerful enough to cause the neuron for Susan’s concept of AND to fire, for example. In my view, the neuron does not have to have this power *because of* repetitive stimulation from her pre-synaptic neurons for P and Q. I will argue that these repetitive connections are *not necessary* to explain how the three rules above govern the neuron for AND. Therefore, the logico-semantic function of this neuron within this inference rule does not derive from these synaptic statistics.

However, there is an inference pattern involving AND that has different philosophical implications than the formally valid rules I discussed above. This pattern is P, therefore P & Q, which, of course, is not a valid deductive inference rule. Rather, it is merely a *pattern* of reasoning, which, as you can see, one may apply to P and Q validly under certain conditions only. Think of a case in which P and Q ascribe analytically related properties, such as being a stay-at-home mom and being female. Susan would use this pattern when she infers that since *Emily is a stay-at-home mom*, she is a stay-at-home mom *and* she is female. As with being female, the property ascribed to Emily in belief Q is contained in the property ascribed to her by belief P. My view is that when non-accidentally valid,[[36]](#footnote-36) this pattern may require s*ome* connection history between the pre-synaptic neuron for P and the neuron for AND of P AND Q. This history, moreover, would result in a *moderately* increased synaptic weight between P and the neuron for (the) concept of AND.

Of course, this type of repetitive synaptic history is fundamentally different from that involved in the other three inference patterns for the connective AND. For the other three rules, neurons for P and Q each have a separate synaptic connection history with the neuron for (the) concept of AND. In contrast, with the current inference pattern, i.e., P, therefore P AND Q, the history of connections is only from P to AND. What is most important, however, is that these connections have happened *because* of other connections between neurons for P and Q themselves. The is a synaptic history between the neuron for Susan’s belief that *Emily is a stay-at-home mom* and the neuron for AND, in other words, because she has a history of believing that *Emily is female* after believing that she is a stay at home mom.

While it may seem trivial, this difference is highly important from a philosophical perspective. It allows you to see my view that the repetitive connections do *not* cause the strong synaptic weight between the neurons for P and for AND. Rather, Susan’s conscious awareness of the deductive relationship between P and Q brings it about. The increased connection value between P and P AND Q would occur *because* she has background knowledge that Q is analytically contained in P. [[37]](#footnote-37) So, even in cases where repetitive neural stimulation *does* account for these beliefs involving AND, it does so because of humans’ higher awareness of the logical implications of propositions involving AND.

3. Higher Intentionality and the Deductive Connective NOT

Above, I discussed the relationship between Susan’s states of knowledge with the form of P AND Q, on the one hand, and repetitive synaptic connections to neurons for her concept of AND, on the other hand. Now, I will begin discussing her knowledge states with the form NOT Q. One goal is to know whether a high synaptic weight alone (as brought about by a repetitive connection history) would explain how her concept of NOT supports the truth of her belief that *it is not true that Eric is a bachelor and Eric is not male*. Would this weight explain how deductive inference rules involving NOT control Susan's reasoning processes? Ultimately, I have two philosophical questions: First, would she need to be consciously aware of the logical relationships between propositions involving NOT in order to make successful inferences using NOT? Next, would she need a conscious intention to think deductively by using NOT?

Imagine that at a point in time *t*, a belief that *it is not true that Jane is a consultant* occurs in Susan mind. Surely, this state must involve her concept of NOT. For the time being, I will define the logico-semantic function of a neuron for NOT in terms of very simple propositions (with the form NOT Q), so they can support her belief that *it is not true that Jane is a consultant*.[[38]](#footnote-38) Suppose that this neuron for NOT represents the falsehood of the proposition that *Jane is a consultant* (Q) because of its repetitive synaptic history with a pre-synaptic neuron. This would mean that were the *truth* of *Jane is a consultant* to be represented in Susan’s mind, then an excitation of a *pre-synaptic* neuron for the ‘Q’ of ‘NOT Q’ would have to accompany it.

These assumptions may seem obvious to you. A serious problem arises at this point, however, because it would be unfeasible for me to define the semantic function of Susan’s concept of NOT in this way. If I use the binary value of 1 for neurons that represent a proposition of the form NOT Q in her mind, then there is only *one* pre-synaptic neuron to connect to this neuron for NOT. To see the problem, begin by assuming that the neuron for NOT fires and establishes a connection to the neuron for Q in Susan’s mind. This would allow her concept of NOT to symbolize the truth of *it is not true that Jane is a consultant*. Arithmetic requires that the neuron for Q *must* have the binary value *0* in order for the neuron for NOT Q to have the value of 1. This, in turn, should mean that the neuron for Q does *not* fire. The question is, how does the firing of 1 represent the falsehood of *Jane is a consultant* (Q), as opposed to any *other* proposition, in Susan’s mind?

One way to put the question is this: If the neuron for *Jane is a consultant* (Q) does *not* fire, then how does binary value (0) support Susan’s entertainment of the possibility that she *is* a consultant? How can we explain her belief that *Jane is not a consultant* through a history of synaptic connections between the neuron for NOT and the neuron for this proposition(Q)? It is hard to answer this if I assume that the neuron for Q does *not* need to fire in order for her to believe that Q is not true. If it does not fire, how can it have an *excitatory* connection with NOT?

4. Higher Intentionality and the Deductive Connective NOT

As you might guess, these problems prevent me from thinking about the synaptic histories of human beliefs of the form NOT Q in the simple, obvious way. I cannot wonder about them in a way that aligns with our common sense of how a human being’s mind works. For powerful philosophical reasons, I should aim to keep my binary interpretation of how neural values represent the truth-values of deductive connectives AND, OR, and NOT, nonetheless. This is because each connective should represent the truth or falsity of a complex proposition based upon the truth values of the simpler propositions it connects. So, I will now consider the role of NOT in propositions more *complex* than NOT Q.

Imagine the concept for NOT1 in Susan’s belief that *it is not true that Emily is a stay-at-home mom* and *Emily is not female*. It has the form NOT1 (P AND (NOT2 Q)), where P and Q are *Emily is a stay-at-home mom* and *Emily is female*, respectively. Her belief is deductively structured, since it asserts the falsehood of a conjunction (P AND (NOT Q)). This conjunction *itself* is complex, as you can also see, since it includes a negation (NOT Q), which stands for *it is not true that* *Emily is female*.

Having seen the logical structure of her primary belief, remember that these secondary, component propositions are also supported, in turn, by neurons for the deductive connectives AND and NOT. In addition, they are supported by neurons that represent simple propositions, such as *Emily is female* (Q), which are *not* attached to connectives. How does Susan draw the conclusion that *it is not true that Emily is a stay-at-home and Emily is not female* from her belief that *Emily is a stay-at-home mom* and *Emily is female*? A set of valid inference patterns might say that from a proposition P AND Q, she can infer:

* P,
* NOT (NOT P),
* Q, and
* NOT (NOT Q)

You probably have noticed that these rules require Susan to believe that it is *wrong* to think that *Emily is not female* after she has assumed that she *is* a stay-at-home momand female. This belief has the form NOT1 (P AND (NOT2 Q)). However, remember the first question I have to answer with this thought-experiment: how would repetitive synaptic connections allow her to infer that Emily is *not* a non-female stay-at-home mom?

With this goal in mind, I should focus on whether the previous connections would have taken place between the *primary* neuron for NOT, i.e., NOT1, and the neuron for of AND? If so, then a sufficient[[39]](#footnote-39) number of times in the past:

* A token of her neuron for the deductive connective NOT (NOT1) would have connected to a token of her neuron for AND, and
* This token for AND would have been the primary deductive connective for an embedded belief of the form P AND (NOT Q), and
* Both the neuron for the proposition P and a token of her neuron for NOT (NOT2) would have connected to the token neuron for AND.

In my view, at whatever time Susan goes through this inference, there is *already* a neural history between her concepts for the primary deductive connectives AND and NOT in this pattern. But, is this the *ultimate* reason that she decides that *it cannot be true that Emily is not female*? Or, does her *conscious* awareness of the relevant analytical entailment relationships *cause* her to make this inference? Does it make her *intend* to think deductively about Emily? These are important questions, because they determine whether I can reductively define these higher-level intentional states. They also have implications for whether I can reduce Susan’s mental states to statistical relationships between neural excitations and connections.

5. Repetitive Synaptic Connections, Conscious Awareness, and Deductive Intentions

We may be able to find some answers in our common knowledge about our own minds. After having a belief of the form P AND Q, such as *Emily is a stay-at-home mom and Emily is female*, the average person does not think of the formal implication that P AND Q entails NOT (P AND (NOT Q)). Rather, she would only affirm the belief that NOT (P AND (NOT Q)) after a certain external challenge or stimulus. That is, Susan would assert it as a passive reaction against either of the *suggestions* that *Emily is not a stay-at-home mom* or *Emily is not female*. Our basic self-knowledge tells us that this reaction would result from her pre-conscious awareness that these suggestions contradict her belief that P AND Q. By ‘pre-conscious’, I mean that Susan is not consciously aware of going through the mechanics of a reasoning process. Rather, her rejection is “passive,” in my view, because it is generated by external suggestions that P is false or that Q is false.

But, what does this mean, you may insist? There is *no* pre-existing pattern in which Susan has a belief of the form:

* P AND Q, then one of the form:
* NOT (NOT Q), and then, one of the form
* NOT (P AND (NOT Q)).

Instead, this is what probably happens:

* Susan first has a belief of the form P AND Q, i.e., that *Emily is a stay-at-home mom and Emily is female,* then
* An external stimulus suggests that P AND (NOT Q), that is, that *Emily is a stay-at-home mom and not female,* then
* Susan infers Q from P AND Q.
* Next, Susan derives NOT Q (*Emily is not female*) from the hypothesis that P AND (NOT Q).
* From this, Susan infers that if P AND (NOT Q) and P AND Q are true, then Q AND NOT Q is true. That is, this absurdity implies that *Emily is female* AND *Emily is not female*. As a result,
* Susan’s instinct to reject contradictions is aroused; and finally
* Susan believes that NOT (P AND (NOT Q)). That is, she knows that *it is not true that* *Emily is a stay-at-home mom and Emily is not female*.

Having reviewed this, I should note that Susan’s pre-conscious rejection of NOT Q (Emily is not female) does not have to depend upon the meaning of Q (that *Emily is female*). Rather, the logical *form* of her pre-existing belief, i.e., that NOT (P AND (NOT Q)), can bring about this rejection. This is why the neuron for NOT may symbolize that Q is false in her mind without establishing an excitatory connection with the neuron for Q. Since she has already believed P AND Q, the deductive form of her belief stimulates her instinct to reject any proposition that contradicts P or Q. This reaction can occur even if she never entertains the meaning of of either P or Q, that is, even if she never considers the analytical implications of Emily’s being a stay-at-home *mom and* not being female.

What does this tell us? When she *does* draw the conclusion that *it is not true that Emily is a stay-at-home mom and Emily is not female*, it is *because* she consciously entertains the entailment relationships the form P AND Q. I do not think that her instinct to reject the idea that *Emily is not female* is enough to explain her conscious conclusion that *it is false that Emily is a stay-at-home mom and Emily is not female*. Rather, it is due to her intentional *choice* to think deductively and to maintain conscious awareness and control over her own thought processes.

How can I know this? Consider the first three steps in her reasoning process:

* A belief of the form P AND Q,
* The hypothesis that P AND (NOT Q), and
* An inference of Q from P AND Q.

In my view, humans definitely have an innate *instinc*t to grasp the concept of the logic of the truth-functional connective AND. When presented with the idea of AND, small children naturally understand that if P AND Q is true, then P is true, and that if P AND Q is true, then Q is true. When presented with a sequence of statements {P, Q}, they also understand that P AND Q is true.[[40]](#footnote-40) Based upon this instinctive comprehension, persons from an early age seem to have a natural cognitive proclivity to engage in reasoning patterns of the following forms:

1. P, Q, therefore P AND Q,
2. P AND Q, therefore P, and
3. P AND Q, therefore Q.

So, Susan would not need a history of repetitive connections in order to infer Q (*Emily is female*) from P AND Q (*Emily is a stay-at-home mom and Emily is female*.) It might even be best to assume that the neuron whose firing symbolizes the truth of P AND Q probably has an *intrinsically strong* synaptic connection with neurons for each of its conjuncts, P and Q. In other words, having a high synaptic weight with its pre-synaptic neurons for P and Q is probably an intrinsic mathematical feature of a neuron for the deductive connective AND. [[41]](#footnote-41)The high numerical value of these connections would probably explain the average person’s innate comprehension of, and proclivity for using, the truth-functional concept of AND from childhood.

As of now, you may be tolerating the perspective I have presented on the *human* concept of AND, namely, that repetitive synaptic connections with neurons for P and Q are not necessary to explain the firing of a neuron for P AND Q. Nonetheless, Susan does not instinctively infer that *Emily is female* after *Emily is a stay-at-home mom and Emily is female* occurs in her mind*.* Rather, she does so of her own intelligent free will. What brings her to do do this? On the one hand, I can assume that it is her conscious awareness of the analytical relationship between Emily’s being a stay-at-home mom and her being female. On the other hand, this awareness might need to be accompanied by her *intention* to think rationally about an intuitively suspicious hypothesis: that *Emily is a stay-at-home mom and Emily is not female.*

What happens next? Let us consider the steps in her reasoning process:

* Susan intentionally derives NOT Q from the hypothesis that P AND (NOT Q).

Obviously, this is trivial, since it is another manifestation of this innate pattern:

* A AND B, therefore B is true.

When she freely derives NOT Q, i.e., the implication that it *is not true that Emily is female*, this should not require a neural history between the AND (of P AND (NOT Q)) and the NOT of (NOT Q). Having understood this, you can see that next, Susan would infer that what she has believed leads to a contradiction; and her thought process would be something like:

* From my belief that *Emily is a stay-at-home mom and* female, and the suggested hypothesis that *Emily is a stay-at-home mom and* not female, it would follow that Emily is both female and not female.
* This is a contradiction of the form (Q AND (NOT Q)).

This mental process, namely, her drawing of the contradiction, is the result of her *conscious* awareness of the entailment relationships between propositions of the form (P AND (NOT Q)) and (Q AND (NOT Q)). It *can* also be the result of her conscious intention to think rationally about the implications of her belief and hypothesis about Emily.[[42]](#footnote-42)

6. Pre-Conscious Contradiction Rejection and Conscious Use of NOT in Deduction

At this point, you may demand more details: How exactly do I *know* that conscious awareness brings Susan to reject her contradictory assumptions? Clearly, a history of repetitive synaptic connections does not explain *why* Susan recognizes that what she has assumed and entertained implies a formal contradiction. If so, she would have had two neural histories: The first would have involved excitatory connections between each of the following:

* The neuron for her concept of AND in (P AND (NOT Q)), and
* The neuron for her concept of AND in (P AND Q), on the one hand, and
* The neuron for concept of AND3 in [(P AND1 Q) AND3 (P AND2 (NOT Q))], on the other hand.

However, this inferential pattern only has this deductive form:

* A, B, therefore A AND B.

As I have already argued, Susan has an innate cognitive *instinct* to derive a conjunction of the form (A AND B) from an immediate sequence of beliefs {A, B}. Clearly, this instinct is not the result of repetitive synaptic connections, either. For the high synaptic weights between the neuron for AND and its two pre-synaptic neurons (for A and B, respectively) is *what* *causes* of the instinct. Specifically, if a pattern of neural connections were responsible for Susan’s realizations that her assumptions are contradictory, there would also be a history between:

* The neuron for the concept of AND3 in [(P AND1 Q) AND3 (P AND2 (NOT Q))], on the one hand, and
* The neuron for the concept of implication in [(P AND1 Q) AND3 (P AND2 (NOT Q))] — > (Q AND (NOT Q)), on the other hand.[[43]](#footnote-43)

However, there is no reason to think that the average person would have a history of believing that propositions of the first form imply formal contradictions. This is because she would not have the psychological habit of entertaining the contradictory implications of simple propositions such as *Emily is a stay-at-home mom and Emily is not female*.

Rather, after recognizing that this hypothesisis inconsistent, Susan would instinctively reject the contradiction, which would have this formal structure:

* NOT2((Q AND (NOT1 Q))

In this case, there would probably be a high synaptic weight between two of Susan’s neurons:

* The primary deductive connective of this denial of the contradiction *Emily is female* *and Emily is not female*, namely, NOT2, and
* The AND of the formal contradiction Q AND (NOT1 Q)

Therefore, Susan’s innate aversion to contradictions probably causes this contradiction rejection; and the high synaptic weight, in turn, is itself the *cause* of her aversion. However, her conscious awareness of the formal contradictory implications of the suggestion that *Emily is a stay-at-home mom and not female* causes her to consciously reject this suggestion as false by drawing the official conclusion.

7. Consciousness of Analytical Entailment vs. Consciousness of Propositional Entailment

At this point, you might notice a problem. As in the case of my example of Susan’s inference about Emily, I have only described inferences where P and Q are *analytically related* propositions. Obviously, her beliefs that *Emily is a stay-at-home mom* and *Emily is female* have this relationship. You could argue that suggesting to Susan that *Emily is a stay at home mom and Emily is not female* would force her to remember that being female is *included* in being a stay-at-home mom. Her reflexive awareness of the analytical relationship between propositions P and Q, you could insist, *disparately* influences the conditions under which she would be likely to draw valid deductive inferences involving these propositions.

This reflex gives her an instinctive awareness of the contradiction between Emily being a stay-at-home mom and not being female; which, as I said, might mean that she would not *need* a *conscious intention* to think rationally in order to *consciously* reject the hypothesis that *Emily is a stay-at-home mom* and *Emily is not female*.This may bias the conditions under which she draws conclusions about analytically related beliefs, in contrast to those that have *propositional* entailments only. For she would think about logical relationships between *Emily is a stay-at-home mom* AND *Emily is female* differently than she thinks about those between others. These are complex, deductively structured propositions, such as (A AND B) and ((NOT A) OR ((NOT B). They use deductive connectives, such as AND, NOT, and OR, to combine simpler propositions, such as B or (NOT A).

Suppose, for example, that A is *Jane is a consultant* and B is *Jane is a New Yorker*. You can see that unlike *analytically* related propositions, the entailment relationships between these *complex* propositions will only have to do with their *logical form*, not with the meanings of A and B. I call these ‘propositional entailment relations’, in contrast to ‘analytical entailment relations’.

What does this mean for reasoning processes in which Susan needs to reject a hypothesis because it implies a contradiction, such as *A and B is true but either NOT A or NOT B is true*? It means that differences in the *kinds* of propositions involved would bring about differences in the conditions under which she detects and rejects contradictions. In order to entertain a contradiction between deductively structured propositions, such as (A AND B) and ((NOT A) OR ((NOT B), she *would* need a *conscious intention* to think rationally. This is because she would *not* have a pre-conscious *instinct* about the entailment relationships of ((NOT A) OR (NOT B)). Yet, she does *not* need a conscious intention to think rationally about *analytically* related propositions, such as *Eric is a bachelor* and *Eric is male*, in order to reject contradictory hypotheses, such as *Eric is a bachelor and not male*.

For more specifics, you might want to note that some contradictions only arise from the deductive form of certain propositions. (A AND B), for instance, contradicts ((NOT A) OR (NOT B)) even when A and B are not analytically related. In other words, suppose that A = *Jane is a consultant* and B = *Jane is a New Yorker*. It it is not their meanings that makes a contradiction between the complex propositions (A AND B) and ((NOT A) OR (NOT B)). Rather, it is that if both *Jane is a consultant* and *Jane is a New York*er are true, then it can’t be that *either Jane is not a consultant or Jane is not a New Yorker*. So, Susan would process these *differently*.

As a prototype of the average person, she can easily recognize that if Jane is both a consultant *and* a New Yorker, then neither “*Jane is not a consultant*" nor “*Jane is not a New Yorker”* can be true. Yet, to acknowledge and recognize this inconsistency, she would need a conscious intention to think deductively about ((NOT A) OR (NOT B)). This would cause her to be *consciously aware that* it contradicts the claim that both A and B are true. However, she does not need this in order to reject the suggestion that *Emily is not female*. [[44]](#footnote-44)

The disparity becomes clearer when you consider this: Many deductively structured propositions are too complex for the average person to have reflexive instincts about. Suppose that in addition to propositions A and B, Susan has to consider proposition C, which means that *Jane is a speed skater*. In this case, she definitely would have to consciously think through the logical form of ((NOT C) AND (B AND (NOTA))) to become aware that it is inconsistent with ((A AND NOT B) OR (C)). This is especially true since her beliefs that *Jane is a consultant* (A), *Jane is a New Yorker* (B), and *Jane is a speed skater* (C) are not logically related.

In my view, this shows that Susan’s conscious intention to think rationally must be what *causes* her to be consciously aware of the entailment relationship between (A AND B) and ((NOT A) OR (NOT B)). So far, I have shown that people can recognize and reject the inconsistencies of analytically related propositions without having a conscious intention to think rationally. I have also shown that you need these conscious intentions to recognize the contradictory implications of some deductively complex propositions. These intentions must cause any conscious awareness you may have of their inconsistencies.

What can we conclude from all this? There are two kinds of entailment relationships related to simple cases of human deduction. We have seen that these are “analytical” entailments and “propositional” entailments. I can also feel comfortable saying that the average person with common sense has to meet two different sets of cognitive requirements when reasoning about these kinds of deductive relationships. To draw inferences involving propositional entailments such as those between (A AND B) and ((NOT A) OR (NOT B)), she must consciously intend to think deductively and he must be consciously aware of these entailment relationships. In contrast, to form valid conclusions about beliefs such as *Eric is a bachelor* and *Eric is not male*, she only needs to be consciously aware of the analytical relationships between the two propositions during the conclusion. Moreover, she often does not need any conscious intention to think rationally, at all.

VII. CONCLUSION

We often know things based on the rationality of our common sense, such as *if Eric is a bachelor, then Eric is male*, or that if *Jane is a consultant and Jane is not a New Yorker*, then she can neither work in consulting nor live in New York. Yet, I have shown that we cannot reduce this kind of knowledge (of simple analytical and propositional entailment relationships) to law-like causal relationships. Nor can we explain it completely through the statistics of synaptic relationships between neurons for our concepts of AND, NOT, and OR. For these reasons, Dretske’s reductive theory of cognitive intentionality cannot explain the analytic knowledge of people. Moreover, we must appeal to conscious, higher-level intentionality to account for our human ability for reasoning (and to account for the deductive knowledge it requires).

1. There is an important sense in which a person can know that *P* even if he is not currently entertaining the proposition *P*, or thinking that *P*. For example, 5 minutes from now, I will know that *2 X 2 = 4*, even though I will not be thinking that *2 X 2 = 4*. Thus, this paper does *not* assume that in order to for a person to know something at time *t,* an occurrent state of knowledge must be in his mind at time *t*. [↑](#footnote-ref-1)
2. Dretske, Fred I. “The Intentionality of Cognitive States.” *The Nature of Mind.* Ed. David M. Rosenthal. Oxford: Oxford University Press, 1991. Print. [↑](#footnote-ref-2)
3. In this work, Dretske does not consider rational justification for beliefs *qua* that which distinguishes states of knowledge from merely true beliefs. He is not putting forth an *epistemological* view in this work, therefore. Rather, it is a restricted account of intentionality. [↑](#footnote-ref-3)
4. While all analytic knowledge is *a priori* for Kant, some *a priori* knowledge, such as geometry, is not analytic. [↑](#footnote-ref-4)
5. (This is a question in the philosophy of intentionality and mental representation.) [↑](#footnote-ref-5)
6. This paper only addresses the intentionality of knowledge. It will not ask the question: What distinguishes knowledge from true belief? Nor will it ask: What makes a true belief justified in a manner that counts as knowledge? Nor will it consider definitions of truth (or ask what gives a belief a particular truth-value). [↑](#footnote-ref-6)
7. We often have beliefs about what goes on inside our *own* minds, such as other beliefs, emotions, sensations, etc. This means that some beliefs connect the mind to a thing that is external to the belief itself, but which is, nonetheless, inside the same mind. For example, I can have a belief that *I have believed that 5 X 5 = 25 since I was seven years old*, or have a belief that *I felt annoyed by voice-mails two hours ago*, or have a belief that *I currently am experiencing a cool sensation from a dining room fan*. [↑](#footnote-ref-7)
8. One can also define a propositional attitude in terms of its logical implications, or, more precisely, in terms of the logical implications of its content. For instance, the “content” of the belief that *the square root of four is two* is the proposition *the square root of four is two*. This proposition implies that *the* *square root of 6 is larger than 2*, and thus the belief that *the square root of 4 is 2* can be defined, in part, in terms of the fact that its content implies *the* *square root of 6 is larger than 2*. [↑](#footnote-ref-8)
9. It would also be reasonable for us to conceive of these properties as “magnitudes;” and we could imagine the causal relation as obtaining between *events*. See Dretske, p. 357. [↑](#footnote-ref-9)
10. Notice the difference between a counterfactual proposition and a material conditional. Consider this counterfactual: *If Suzy had not dropped the glass, the glass would not have shattered* (A), in contrast to this material conditional: *If Suzy drops the glass, the glass will shatter* (B). Both propositions, like all conditionals, are composed of two simpler propositions: an antecedent (*Suzy throws the glass*) and a consequent (*the glass shatters*). Yet, suppose that *Suzy throws the glass* is *false* and *the glass shatters* is *true*. In this case, A is false while B is true. [↑](#footnote-ref-10)
11. (This could be because w1 was heated to just one degree lower than the point at which it would give off steam. Reaching that level of heat could have triggered the artificial process by which the molecules were separated automatically, which, in turn, would render w1 gaseous.) [↑](#footnote-ref-11)
12. The American Heritage® Dictionary of the English Language, Fourth Edition; Copyright © 2009 by Houghton Mifflin Company. [↑](#footnote-ref-12)
13. This relation also obtains between the quantity of torque and the amount of current flowing between the points. [↑](#footnote-ref-13)
14. p. 358. [↑](#footnote-ref-14)
15. Although all of his examples of knowledge states are about individual things or stuffs, Dretske makes a distinction between knowledge of “facts” and knowledge of things. The examples qualify as knowledge of *fact*s. For example, a judgment that the *flower on my dinner table is a carnation* is a judgment of fact about the flower, because it is a judgment involving the proposition *the flower on my dinner table is a carnation*. It is not a direct judgment of the flower. Moreover, as explained earlier, Dretske’s examples are all propositional attitudes of knowing that *P*. [↑](#footnote-ref-15)
16. This does not mean that *all* judgments are instances of knowledge. Clearly, some are simply false; and some that are true, nonetheless, lack the justification that would permit them to qualify as knowledge. [↑](#footnote-ref-16)
17. *Critique of Pure Reason*, Second Edition, p. 2. [↑](#footnote-ref-17)
18. Dretske, p. 354. [↑](#footnote-ref-18)
19. To assert that it is a law that *all Fs are Gs* is to assert something stronger than that *nothing is F that is not G*. [↑](#footnote-ref-19)
20. The category of empirical knowledge was first defined explicitly in the context of the philosophical view termed ‘Empiricism’. Empiricists hold that all knowledge of *things* is caused by and justified by experience, in contrast to being caused by pure analysis of abstract ideas. Our concepts of concrete physical things are caused by experience, particularly sensory perception. Since they are made up of such empirical concepts, our beliefs about these things are justified by observation-based experiences (and the evidence they provide). Thus, we define our knowledge of things in terms of this empirical justification. [↑](#footnote-ref-20)
21. Dretske does give a few schemas or formulae that may be types of particular judgments. [↑](#footnote-ref-21)
22. Charles Parsons, “The Transcendental Aesthetic,” in *The Cambridge Companion to Kant*, ed. Paul Guyer, Cambridge University Press, 1992, p. 65. [↑](#footnote-ref-22)
23. In principle, the only category of singular judgments that could be justified *a priori* are those of the form ‘the bachelor is male’. These have the form ‘the x is F, where ‘x’ refers to a category that includes property F in its definition. (Philosophical questions surrounding definite descriptions are not relevant for the present purposes.) [↑](#footnote-ref-23)
24. Brian Loar, “Can we Explain Intentionality?” in Meaning in Mind: Fodor and His Critics. Barry Lower and Georges Rey (eds.), Cambridge: Blackwell Press, 1991, p. 120. [↑](#footnote-ref-24)
25. An object’s “occurring” usually means that its physical presence causes some type of perceptual experience in a person’s mind at a given point in time. Presumably, it is from this perception that the concept develops. [↑](#footnote-ref-25)
26. p. 361. [↑](#footnote-ref-26)
27. p. 358. [↑](#footnote-ref-27)
28. I assume this is a physical object, since he uses a term translatable as ‘bodies’. [↑](#footnote-ref-28)
29. There is no *a posteriori* analytic type of knowledge. [↑](#footnote-ref-29)
30. Clearly, there is still a kind of analytic knowledge in which we know that two propositions are logically equivalent, or that P entails Q *and* Q entails P. For textual and philosophical reasons, I only discuss human knowledge of analytical relationships between those that are not equivalent. What is most important is not that we can mechanically translate beliefs such as (A AND B) and (B AND A). Rather, it is that we can know that *Eric is a bachelor* implies that he is male and that *Susan is a stay-at-home mom* implies that she is female, for example. [↑](#footnote-ref-30)
31. [↑](#footnote-ref-31)
32. You might want to note that this “conscious intention” is actually another form of higher intentionality, since it is a desire that one’s own self think rationally. Therefore, this desire is a second-order intentional state. In addition, its propositional content - *I think rationally*- refers to first-order intentionality. This is because to think rationally is, itself, to have an intentional state. [↑](#footnote-ref-32)
33. That is, each inference involving the abstract, non-quantitative properties of common sense. [↑](#footnote-ref-33)
34. Analogously, I assign a value of 1 to a model neuron for NOT, which represents Susan’s belief that *it is not true that Eric is a consultant*; and I would assign a value of 1 to a model neuron for OR to represent her belief that [*either] Eric is male* OR *Eric is female*. From a truth-functional standpoint, she could have a belief with the form P OR Q under three binary scenarios. The first is when her neurons for the simpler propositions P and Q each have the value of 1. The second is when her neuron for P has value 1 and her neuron for Q has the value of 0; and the last is when her neuron for P has value 0 and her neuron for Q has value1. [↑](#footnote-ref-34)
35. In addition, the average person does not have pre-conscious or automatic beliefs with the deductive forms NOT (P AND (NOT Q)) or NOT ((NOT P) OR (NOT Q)). This means that a higher level of consciousness and intelligence must be involved in drawing conclusions from beliefs with these forms. [↑](#footnote-ref-35)
36. That is, when the person does not just accidentally think in a valid pattern of P, therefore P AND Q. [↑](#footnote-ref-36)
37. (This background knowledge could be be instinctive, intuitive, common sensical, or analytical.) [↑](#footnote-ref-37)
38. As explained earlier, I assume a binary interpretation according to which the number 1 signifies that the neuron for the mental state fires and the number 0 signifies that it does not.) [↑](#footnote-ref-38)
39. The mathematics of this is not consequential for the current purposes, but I would align my definition of ‘significant’ with those of Artificial Intelligence and Connectionist views. That is, I would assert that statistical constraints govern her synaptic connections based on repetitive histories of connections. [↑](#footnote-ref-39)
40. My argument for this would be simply that there does not appear to be an explanation for how children would acquire these deductive concepts from experience without already having them. It is relatively obvious that human beings would acquire evolutionary advantages from this inferential capacity. [↑](#footnote-ref-40)
41. (In fact, I may be justified, from a theoretical perspective, in considering this one of its *defining* features.) [↑](#footnote-ref-41)
42. Yet, in my view, this deductive intention is not necessary in cases of *analytical* entailment. [↑](#footnote-ref-42)
43. I am assuming that the concept of material implication, not logical implication, reflects the average, common sense-based view of inferences. [↑](#footnote-ref-43)
44. Even if there were some cases of analytical entailment in which she does need conscious intentions to think rationally, they would be at the very end of much more complex inferences. [↑](#footnote-ref-44)