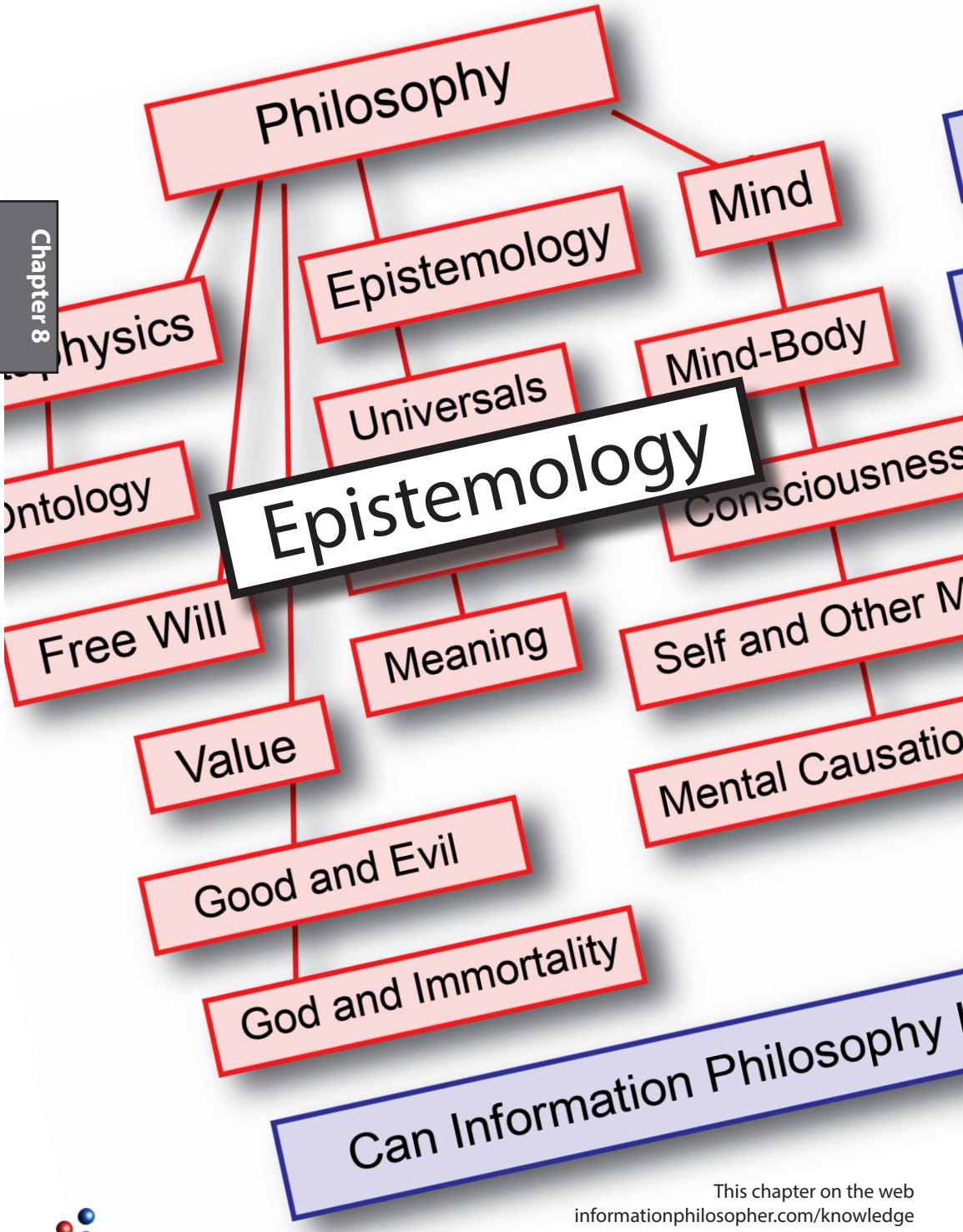

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Epistemology

Epistemology asks, "how do we know what there is?"

Immaterial information provides a new ground for epistemology, the theory of knowledge. We know something about the "things themselves" when we discover an *isomorphism* between our abstract ideas and concrete objects in the material world. Information philosophy goes beyond the logical puzzles and language games of analytic philosophy. It identifies knowledge as information in human minds and in the external artifacts of human culture.

Abstract information is the foundation – the metaphysical ground – of both logic and language as means of communication. It is the part of a dualism parallel to the material substrate that the Greeks called ὑποκείμενον - the "underlying." It gives matter its form and shape. Form informs.

Knowing how we know is a fundamentally circular problem when it is described in human language, as a set of logical propositions. And knowing something about what exists adds another complex circle, if the knowing being must itself be one of those things that exists.

These circular definitions and inferences need not be vicious circles. They may simply be a coherent set of ideas that we use to describe ourselves and the external world. If the descriptions are logically valid and/or verifiable empirically, we think we are approaching the "truth" about things and acquiring knowledge.

How then do we describe the knowledge itself - an existing thing in our existent minds and in the existing external world? An information epistemology does it by basing everything on the abstract but quantitative notion of information.

Information is stored or encoded in physical and biological structures. Structures in the world build themselves, following natural laws, including physical and biological laws. Structures in the mind are partly built by biological processes and partly built by human intelligence, which is free, creative, and unpredictable.

Knowledge is the Sum of information created and stored in minds and in human artifacts like stories, books, and internet-worked computers.

The History of Epistemology

Although the English word "epistemology" is relatively new (coined in the 19th century), it has been known for centuries as the problem of knowledge (*Erkenntnisproblem* in German), and appears in the earliest philosophical works - by the Presocratics, Plato and Aristotle, and especially by the Skeptics, who doubted that it could be proved that knowledge is possible.

Sophists

The great sophist Gorgias challenged the many physicists (φυσικοι) who lectured and wrote on "what there is" in treatises called "Peri Physis" (Περι Φύσις) - roughly, About Nature, or the Nature of the Physical World.

The content of a typical physicist/philosopher lecture in Gorgias' time was usually in three parts:

Things exist

You can know what things exist

You can tell others about what exists

Gorgias is reported to have dazzled and delighted his audiences by proving the opposites, by using nearly identical arguments:

Nothing exists

If by chance something did exist, you could not know anything about it

If you did accidentally learn something about it, you could not communicate your knowledge to others

The lesson we can take away from Gorgias is that arguments, especially verbal reasoning alone, can be used to prove anything by clever rhetoricians. Logical and linguistic arguments can tell us nothing "true" about the physical world.

This is the problem of knowledge. How can we know - how can we be certain about - what we know? It is related closely to the

question of what abstract concepts and physical objects (ontology and cosmology) exist in the universe - what are "the things themselves" - for us to know.[1] How is what we perceive through our senses related to the physical things and the abstract concepts that our reason tells us lies behind the laws of nature (metaphysics).

Plato/Socrates

In his *Theaetetus*, PLATO tells us that SOCRATES considered, but ultimately rejected, three possibilities for what knowledge (ἐπιστήμη) is and how we come to have it.

- The first is perception (αἴσθησις). Our perceptions are "true" (ἀληθῆ), at least to us, a kind of private knowledge. But they may be dreams or illusions. (160D)

- The second is true (ἀληθῆ) opinion or belief (δόξαν). Socrates asserts that PROTAGORAS's relativistic argument that "man is the measure of all things," means "what is true is what is true for me." But "myriad" others may properly judge your opinion false (ψευδῆ).(170D)

- The third is true belief that had some reasons (λόγος) or justification (συλλογισμῶ), a rational explanation for the belief. True (or right) opinion accompanied by reason is knowledge. (δόξαν ἀληθῆ μετὰ λόγου ἐπιστήμην εἶναι) (202C)

This third possibility that knowledge is "justified true belief" has come down to modern times as the three-part "traditional" theory of knowledge. Although Socrates' "negative" dialectic never established any certain knowledge, Plato believed that Socrates' method of inquiry (ἔλεγχος) is a way to achieve knowledge.

Nevertheless, the *Theaetetus* ends with Socrates' utter rejection of perception, true belief, or even true belief combined with reasons or explanations as justification. Socrates says:

> "And it is utterly silly, when we are looking for a definition of knowledge, to say that it is right opinion with knowledge, whether of difference or of anything else whatsoever. So neither perception, Theaetetus, nor true opinion, nor reason or explanation combined with true opinion could be knowledge (epistéme)."[2]

1 See chapter 3 on ontology.
2 Plato's Theaetetus, (210A-B)

Aristotle

Aristotle revised his master Plato's theory of Forms and Ideas. Although he too sought the fundamental essences of things and ideas (their Being - τὸ ὄν), for Aristotle all things were a combination of form (εἴδος) and matter (ὑλῆ), and understanding how real physical things change (their Becoming) was as important as knowing their essences (their Being).

In his *Metaphysics*, Aristotle dealt with the problem of knowledge (epistemology) and with the question of Being (ontology of both physical and abstract things). The opening line of Book I of the *Metaphysics* is "All men desire knowledge by nature." (πάντες ἄνθρωποι τοῦ εἰδέναι ὀρέγονται φύσει.) He uses the word to know (εἰδέναι) based on "to have seen (the form)."

Aristotle sharpened the use of language (dialectic) and logic as our means of knowing to a level still in use today. He analyzed subject-predicate sentences and puzzled over the relationship between being or essence and the copula "is." He elucidated the simplest rules of logic - needed for the reasoning (συλλόγος) behind justification of knowledge - the Law of Identity (A is A), the Law of Non-Contradiction, and the Law of the Excluded Middle. And he developed the rules for logical inference, identifying many types of syllogism. Socrates had already identified the simplest syllogism - S is M, M is P, therefore S is P.

But Aristotle went beyond pure reason and the Platonic dialectic. He added the need for demonstration (ἀποδειξις) to discover the cause (ἀιτια) and find an explanation of a phenomenon. This was the beginning of empirical knowledge, the observations and experiments that form the basis of modern science, as opposed to the kind of personal and subjective knowledge available directly to our perception, intuition, or reflective introspection.

Aristotle identified four basic causes (material, formal, efficient, and final) and said that chance might be a fifth cause. Not everything happens of causal necessity, but some things are just as chance will have it, he said.

He distinguished certain *a priori* knowledge, for example logic and mathematics, which was true by necessity, from the merely probable and contingent *a posteriori* knowledge of ethics and politics. He denied that the truth of a proposition about the future entailed the necessity of a future event (as claimed by the actualist Diodorus Cronus). The future is open and contingent.

For Aristotle, there were different methods of inquiry and different kinds of knowledge depending on the subject matter, for example knowledge of the things themselves in the external world (ontology and metaphysics) that we would call today the physical sciences, and knowledge about people (ethics and politics) that today we would call the social sciences. We might add psychology, especially the subjective and reflective knowledge of self by introspection. And although he wanted to be more empirical than Plato, he held onto some necessary truths or first principles that were self-evident. He also recognized "theses" (θέσισ) and "axioms" (ἄξιος).

And Aristotle distinguished many kinds of logical argument. When the premises are true and certain (he does not explain how this can be the case except for those that are self-evident "first principles" - ἀρχὴ or πρῶτων), and when the deductive syllogism is correct, the conclusions must follow. Aristotle calls this a demonstration, the truth of it is apodeictic (ἀπόδειξις), a logical proof. The resulting knowledge is demonstrative knowledge (ἀποδεικτικὲω ἐπιστήμην).

Aristotle realized that not all reasons given to justify beliefs could themselves have reasons without an infinite regress or circular argument, so he proposed that some reasons could be "self-evident" axioms, worth believing on their own merits or because they are popular opinion.

Returning to Plato here, Aristotle says that all parts of this demonstration - premises, deductions, and conclusions - are necessary. When the premises are popular opinion, their truth merely probable, the argument is dialectical. When the premises are false, the argument is sophistical, and can prove anything. Much of modern epistemology feels disturbingly *sophistical*.

Skeptics

Shortly after Aristotle, Pyhrro of Ellis reacted to the many methods of inquiry (σκέπσις) and their knowledge claims by denying all of them. His skeptical followers argued that happiness and serenity can be had by avoiding unjustified dogmatic knowledge claims and simply follow traditional customs as a guide to life.

Plato's Academy itself came to adopt skepticism under Arcesilaus in the third century. Arcesilaus doubted that the senses could discover truths about the physical world. Skeptics, especially Carneades, who followed Arcesilaus as leader of the Academy, denied the claims of their opponent Stoics as mere dogmatism.

Philo of Larissa, the last leader of Academic Skepticism in Athens, escaped the Mithradatic wars and went in 88 BCE to Rome where he mentored Marcus Tullius Cicero. Cicero gave us perhaps the best ancient comparison of the Stoic, Epicurean, and Skeptical schools of philosophy in his dialogue *De Natura Deorum* (On the Nature of the Gods), which was David Hume's model for his *Dialogues Concerning Natural Religion*. and a source for his own mitigated skepticism.

Aenesidemus, the first-century leader of Academic skepticism in Alexandria, qualified the obvious self-referential error in the skeptical claim that nothing could be known. He encouraged a return to Pyrrho's suspension (εποχή) of any judgment. Aenesidemus identified ten tropes or modes of knowing by perception through different senses, which he showed can be mutually inconsistent. Epistemological justification of any absolute objective knowledge is therefore impossible.

According to Sextus Empiricus,[3] these ten tropes were reduced by Agrippa to five

- Disagreement among the philosophers
- An infinite regress of justification
- Relativity - concepts are meaningful only in some context
- Hypotheses cannot be self-evident
- Circular reasoning

3 *Outlines of Pyrrhonism*, 1.164-77

And finally, Sextus Empiricus says (1.178-79) the reasons to suspend judgment can be reduced to only the first two. He says that nothing can be apprehended through itself (immediate knowledge) or through another thing (mediate knowledge) is shown by the controversies among the philosophers. And the infinite regress of reasons is caused by the lack of a criterion for truth (κριτεριόν τῆσ ἀληθείας). These two problems are still very much with us today,

An infinite regress arises when we ask what are the justifications for the reasons themselves.

For the reasons to count as knowledge, they must themselves be justified with reasons for the reasons, etc., *ad infinitum*.

Stoics

Chrysippus, the greatest and most prolific of the Stoic leaders, separated the idea of *necessity* in certain knowledge from necessity in human actions, without denying the Stoic belief in physical determinism and fate. He helped to develop propositional logic, a language advance on Aristotle's predicate logic that Gottlob Frege revived in the nineteenth century as the propositional calculus.

Chrysippus saw logic as the core of a divine reason that rules the universe. He saw Laws of Nature are synonymous with the Laws of God, since Stoics identified God with Nature. In his time, Chrysippus' logic was considered superior to Aristotle's.

The Search for Knowledge Turns Inward

"What can I know with certainty?" asked René Descartes. What is it that cannot logically be doubted? Starting with his famous "*Cogito, ergo sum*," Descartes said he could not doubt his own existence, then - since "God is no deceiver" - he could not be wrong about his perceptions. This is despite Plato, who knew perceptions can be illusions, such as the stick appearing bent in the water.

Descartes shifted the emphasis of knowledge from the external world to his internal thoughts, and began an effort to find indubitable truths as foundations for all knowledge. Descartes' introspective "quest for certainty" changed the focus of problem of knowledge to what twentieth-century philosophy would come to call "foundationalism and "internalism"."

Even if Descartes could have arrived at subjective knowledge that he personally could not doubt, such knowledge would be inaccessible to others. And others would be properly skeptical of his egocentric knowledge claims.

Gottfried Leibniz argued that certainty could be had for necessary truths that are "true in all possible worlds." Leibniz's *Principle of Sufficient Reason* was a claim that knowledge of the physical future was implicit in the fact that every event has a sufficient cause. This is despite Aristotle, who knew that future events might or might not happen, for example, the famous "sea battle."

David Hume, skeptical that anything could be proved true by induction, declared causality to be simply a matter of repeated conjunctions of apparent cause and effect. With his empirical colleagues, John Locke and George Berkeley, he denied any knowledge of the "things themselves" behind our perceptions. We have only the sense impressions of Locke's "secondary qualities."

Hume, following Leibniz, admitted as knowledge only two things, analytical mathematical logical reasoning, and empirical facts. This is essentially the *analytic-synthetic* knowledge distinction.

> "If we take into our hand any volume; of divinity or school metaphysics, for instance; let us ask, Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Consign it then to the flames: For it can contain nothing but sophistry and illusion."[4]

Despite his skepticism about causality, Hume's "naturalism" convinced him of the practical truth of strict causal determinism.

"What can I know?" asked Immanuel Kant. Faced with the skepticism of Hume which put into doubt all phenomenal knowledge gained by perception alone, Kant postulated a noumenal world accessible to the mind by introspection. There the "things themselves" exist along with God, human freedom, and immortality. But since they are outside the phenomenal world - the physical world governed by strict causal deterministic laws of motion - Kant's claim to knowledge was as weak as Hume's skeptical claim was strong.

4 *Enquiry Concerning Human Understanding*, section XII

Kant accepted Hume's (and Aristotle's) distinction between abstract analytic *a priori* knowledge and experimental or empirical synthetic *a posteriori* knowledge. But he claimed that the human mind imposed certain categories of understanding on the world, leading to some necessary empirical truths, or what he called *synthetic a priori* knowledge. Among these are that space must necessarily be Euclidean, that "7 + 5 = 12" is mathematically necessary, and that the deterministic laws of Newton must be strictly true.

Although all these "truths" have been found empirically to be false, modern developmental psychology finds that some ideas are indeed "built-in" to the mind, as Kant held. Infants are born able to recognize continuity, contiguity, causality, and form. These conceptual abilities are transmitted genetically and are immediately available. They do not need a set of prior experiences from which to abstract. Konrad Lorenz described them as the experiences of our ancestors. What is *a priori* for ontogeny in the phenotype was *a posteriori* for the phylogeny of the genotype. Thus Locke's *tabula rasa* dictum that everything that is known comes first through the senses is wrong.

The nineteenth-century hermeneuticists Schleirmacher and Dilthey argued for some knowledge accessible in non-scientific ways. They claimed that cultural knowledge can only be appreciated and understood by someone immersed in the culture.

Charles Sanders Peirce defined knowledge - truths about the real world - as that knowledge that would eventually be agreed upon "intersubjectively" by a community of inquirers who follow an open scientific method of hypothesis, deduction, and experimental testing of predictions by means of observations.

As to Descartes' search for indubitable certain knowledge, Peirce agreed that any knowledge should be doubted. But, explaining Descartes' two errors, Peirce says first that everything cannot be doubted at the same time. And second, that nothing is ever certain because the method of science always leaves open the possibility for improvements in our knowledge. Peirce's pragmatic "truth" is something that is only asymptotically approached over time by the *intersubjective agreement* of an open community of inquirers.

Peirce's "pragmatic" philosophy identified truth with beliefs that informed action and had valuable consequences. This led to John Dewey's idea of truth as "warranted assertability," with the warrants to be found in the empirical consequences.

Bertrand Russell declared that science is the only source of knowledge, "What science cannot discover, mankind cannot know." This came to be called "scientism."

Logical empiricists, following Russell's student and colleague Ludwig Wittgenstein, could never agree on the method of justification. The Vienna Circle philosophers, Rudolf Carnap and Moritz Schlick, never could get general agreement on what constitutes the "verification" of a proposition about the world.

A. J. Ayer, who sat in on some Vienna Circle meetings, put their ideas forward in his book *Language, Truth, and Logic*. He said (again following Hume and Aristotle) that two kinds of propositions are meaningful - analytic sentences (tautologies and definitions of language terms) or statements that can be empirically verified.

Karl Popper denied that "verification" could ever lead to certain knowledge, but argued that even one negative experimental result can "falsify" a proposition.

In the early 1950's, Willard van Orman Quine challenged the ancient analytic-synthetic distinction, arguing that in the end the "truth" of analytic statements, the proofs of mathematical theorems, and the use of logic, also depend on some empirical verification.

The key idea of Quine's empiricism is to deny the existence of any *a priori* knowledge of the world (or of words - statements, propositions), whether analytic or synthetic. As Peirce had said, nothing is logically and necessarily true of the physical world. Logical truths like the Principles of Non-Contradiction and Bivalence (Excluded Middle) might be true in all possible worlds, but they tell us nothing about our physical world, unless they are applicable and empirically verified.

Gettier Problems

In 1963, Edmund Gettier published two logical counterexamples to knowledge defined as justified true belief. His counterexamples were true, but not for the reasons cited as the evidence for justification. So the result is a justified false belief, or perhaps simply not knowledge.

The conditions postulated in Gettier-type examples are extraordinarily unlikely to occur, but the mere possibility demonstrates the difficulty of making logical arguments about contingent real world situations. The most sophisticated linguistic analysis is problematic as a source of "truth" or justification.

There is a technical similarity between Gettier cases and Frankfurt-type examples of an agent who apparently acts "freely" but a counterfactual demon ensures that there is only one possibility for action. In 1969 Harry Frankfurt developed logical counterexamples to the traditional idea that *alternative possibilities* are a prerequisite for free agency, because compatibilism had no alternatives.

Gettier cases artificially construct a "true" situation which is not true for the apparent reasons. Frankfurt cases artificially construct a "free" action in which the agent actually is not free to choose the apparent alternative possibilities. Gettier and Frankfurt cases have spawned a vast philosophical literature in the past few decades. But they have produced little advance in understanding either knowledge or freedom. They are little more than clever examples of the sophistry in today's analytic language philosophy.

Skepticism alone should have indicated that logical proofs of knowledge, or logical analyses of any justification scheme for knowledge, were bound to fail. Gettier and Frankfurt cases are applied skepticism or sophistry that cast doubt on the likely validity of common sense justifications and knowledge, by developing extremely unlikely if not implausible cases. They depreciate the value of the central project of epistemology, which is to help us to know (if only in a virtuous circle) when our arguments for knowledge are as strong as we can make them.

Epistemology Returns to "Externalist" Justification

Until the 1960's, debates in epistemology were primarily divided between Cartesian foundationalist and coherentist theories of justification, both of which focused on egocentric subjective "internalist" theories.

Until Descartes's turn inward, theories of knowledge had assumed that justification included the relation of beliefs to objects and events in the world. Descarte's "internalist" turn continued well into the twentieth century, with most epistemologists endorsing his "foundationalist" theory of knowledge. They included C.I. Lewis (1946), Roderick Chisholm, John Pollock (1986), Richard Foley (1987), Paul Moser (1989), William P. Alston (1989), and Robert Audi (1993).

But several philosophers moved toward an "external" view of epistemology. As early as the 1920's, Frank Ramsey had proposed the idea of *reliability*, which depends on some kind of external causal process. He said that a belief was knowledge if it was (i) true, (ii) certain, and (iii) obtained by a *reliable* process.

In 1967, Alvin Goldman amplified the Ramsey view, endorsing both a "causalist" theory of knowledge and what he called "reliabilism."He claimed that justification for a belief is to be found in the natural cause of the belief.

In 1971, Fred Dretske offered what he called "Conclusive Reasons" as a form of justification. They included evidence, grounds, and reasons.

In 1973, David Armstrong called for a return to what he called "externalism," defined as "a certain relation holding between the believer and the world." For example, one can not only believe, but know, that the room is hot because the excessive heat one feels is the cause of one's belief. Armstrong further divided externalist theories into "causal" (like Goldman) and "reliability" (like Dretske and Ramsey) theories.

There are other externalist theories, including naturalism, evidentialism, and evolutionary epistemology.

Epistemology Naturalized

In the late 1960's, Willard van Orman Quine argued that epistemology, the justification of knowledge claims, should be "naturalized." All knowledge claims should be reduced to verification by the methods of natural science. "For suppose we hold," he says, "with the old empiricist Peirce, that the very meaning of a statement consists in the difference its truth would make to possible experience." Quine wrote:

> "The Vienna Circle espoused a verification theory of meaning but did not take it seriously enough. If we recognize with Peirce that the meaning of a sentence turns purely on what would count as evidence for its truth, and if we recognize with Duhem that theoretical sentences have their evidence not as single sentences but only as larger blocks of theory, then the indeterminacy of translation of theoretical sentences is the natural conclusion.
>
> "Philosophers have rightly despaired of translating everything into observational and logico-mathematical terms. They have despaired of this even when they have not recognized, as the reason for this irreducibility, that the statements largely do not have their private bundles of empirical consequences. And some philosophers have seen in this irreducibility the bankruptcy of epistemology. Carnap and the other logical positivists of the Vienna Circle had already pressed the term "metaphysics" into pejorative use, as connoting meaninglessness; and the term "epistemology" was next. Wittgenstein and his followers, mainly at Oxford, found a residual philosophical vocation in therapy: curing philosophers of the delusion that there were epistemological problems.
>
> "Epistemology, or something like it, simply falls into place as a chapter of psychology and hence of natural science. It studies a natural phenomenon, viz., a physical human subject...
>
> "The old epistemology aspired to contain, in a sense, natural science; it would construct it somehow from sense data. Epistemology in its new setting, conversely, is contained in natural science, as a chapter of psychology. But the old containment remains valid too, in its way... There is thus reciprocal containment, though containment in different senses: epistemology in natural science and natural science in epistemology."[5]

Although Quine's reciprocal containment suggested that epistemology might still play a foundational role in scientific understanding, his work appeared to many to reduce epistemology to psychology. Quine seemed to deny the normative role of traditional epistemology to justify all knowledge, including scientific knowledge. An information epistemology can restore that role.

5 *Ontological Relativity and Other Essays* 1969, pp.80-3

An Information Epistemology?

Second only to Kant's "scandal" that philosophers cannot logically prove the existence of the external world, it is scandalous that professional philosophers are in such profound disagreement about what it means to know something. They may not all be wrong, but few of them are likely to be right.

This is especially dismaying for those epistemologists who still see a normative role for philosophy that could provide a foundation, perhaps even *a priori*, for scientific or empirical, *a posteriori* knowledge.

Information epistemology avoids the traditional identification of knowledge with "belief." Belief is a psychological state that may be, and often is, disjoint from knowledge. We may empirically verify that a person knows something by analyzing her behavior, without her consciously articulating or holding a belief in that knowledge. A famous example is the difference between linguistic competence and mere performance, knowing the grammatical rules for one's language without being able to state those rules. Those rules have been learned tacitly, by multiple trials and errors, and stored in a person's mind, in our experience recorder and reproducer (ERR).[6]

Human knowledge is not only information stored in the mind. It is also recorded in human artifacts like stories, books, buildings, and internetworked computers. Knowledge is information that forms the basis for human thoughts and actions. In information philosophy, knowledge is information that is "actionable," meaning that if we act on the basis of the information, our actions will have fruitful consequences. The validity or pragmatic "truth" of knowledge is to be found in those consequences.

Since information is also stored in animal minds, we can reject the exceptionalist fiction that only humans can have knowledge. Where humans are indeed exceptional is their ability to communicate their knowledge - and their reasons for their knowledge - symbolically by means of language.

Information is stored or encoded in information structures. Although structures in the material world build themselves,

6 See Appendix E for details.

following natural laws, they do not *assemble* themselves. This is the material *first world* of information philosophy.

In our second world, biological systems are cognitive systems in the sense that they also *process* and *communicate* knowledge (information). They bring *purpose* into the universe. They are "*teleonomic*." They cannot be reduced to the laws of physics and chemistry. They are not machines, which must be assembled. Biological systems assemble themselves, using their internal knowledge. This is the biological *second world* of information philosophy.

Structures in the mind are partly built by biological processes and partly built by human intelligence, which is free, creative, and unpredictable. The information in mental structures is uniquely mobile. It is not confined to its structure. As knowledge, it is the *immaterial* stuff of thought - our ideal *third world*."

A majority of the *Sum* of unique human knowledge may now be stored external to our minds. Even collectively, we don't know (in the sense of having it in mind) all that we know. But we (including almost anyone in the world) can look it up extremely quickly.

Among the sources of knowledge are the theories and experiments of natural scientists, who collaborate to establish our knowledge of the external world, social scientists who study our cultures, and psychologists, cognitive scientists, and neuroscientists, who investigate our personal subjective worlds.

To the extent of the correspondence, the isomorphism, the one-to-one mapping, between structures (and processes) in the world and representative information structures in our minds, we can claim to have knowledge of the world, and of other minds.

Such knowledge claims are not based on logical arguments about justification, but on the pragmatic truth that the knowledge has consequences that can be empirically or "naturally" confirmed.

Information epistemology is a *naturalized* epistemology.