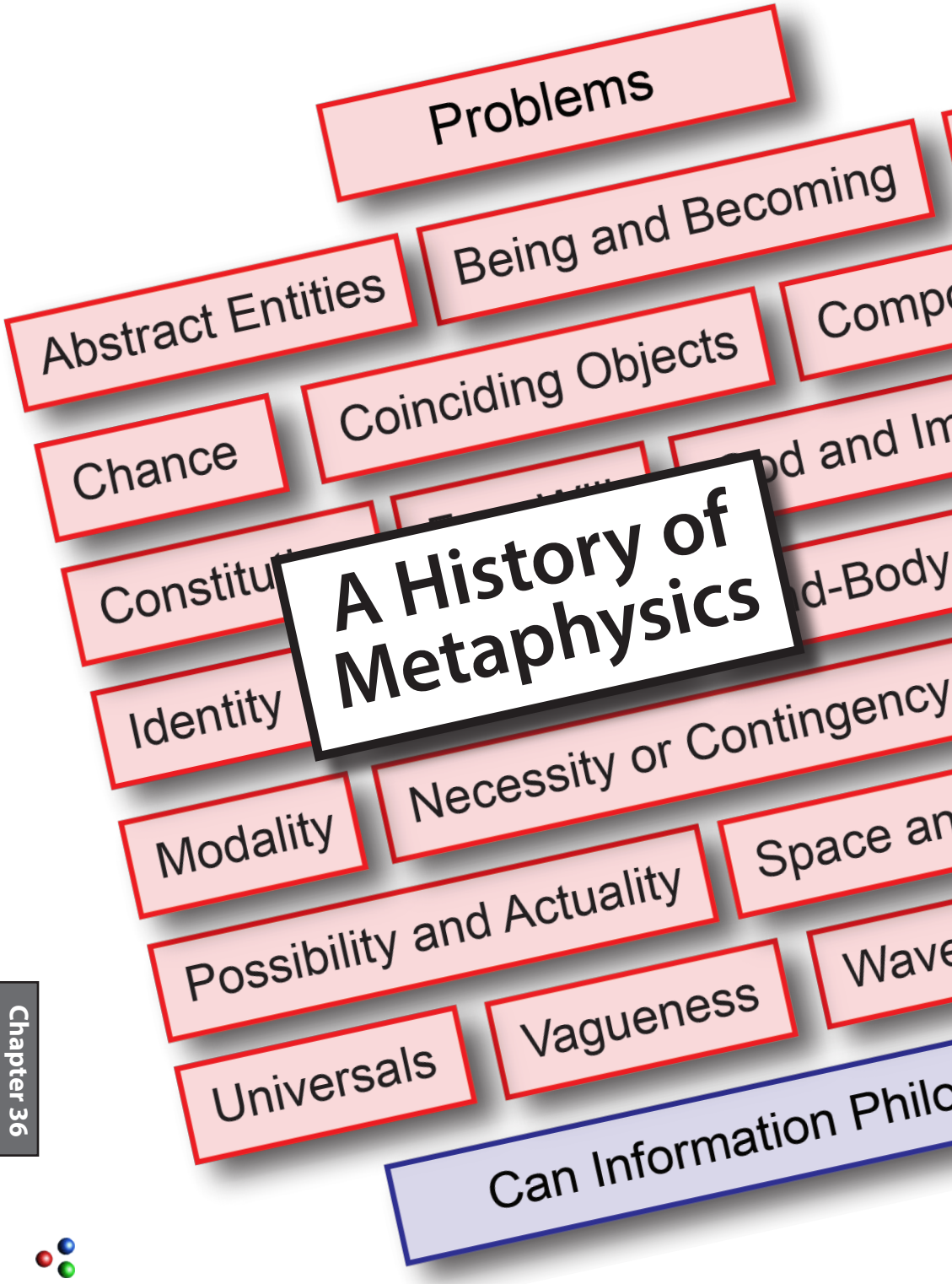
Problems
Abstract Entities
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A History of Metaphysics

The Presocratics

Although metaphysics properly begins with Aristotle's search for the underlying principles of reality, he looked to the claims of the pre-Socratics as possible answers to deep questions such as "what is there?" and what are the causes behind everything.

Most of their pre-Socratic claims were speculations about the physical nature of the cosmos and its origins. In some ways, the pre-Socratics might be viewed as the earliest natural scientists, with their strong interest in physics, chemistry, astronomy, geology, meteorology, and even psychology. By contrast, Socrates would change the subject to ethical issues. It took Aristotle to return to cosmological, theological, and metaphysical issues first raised by the pre-Socratic philosophers and great authors like Homer and Hesiod.

The two great antagonist views were from Parmenides and Heraclitus. For Parmenides, "All is One," there is no such thing as nothing (the void of the atomists), and change is an illusion (all of Zeno's paradoxes of motion supported his master's claims).

For Heraclitus, by contrast, "All is Flux." There is nothing but change. "You can't step in the same river twice." The one great positive insight of Heraclitus was that behind all changes there are laws – the "Logos." He clearly anticipates the modern notion of the laws of nature that control all change.

Aristotle gives great credit to several pre-Socratic philosophers, starting with Thales of Miletus, for attempting "natural" explanations for phenomena where earlier thinkers had given only poetic, mythological, or theological stories. Although the explanations were very simple, they were as basic as could be. Thales said "All is Water." This means everything material now is somehow made from water. This is the sort of basic principle and discovery of basic elements of nature that Aristotle was after.

For Anaximander of Miletus, the first principle is a sort of indefinite and unbounded moving element. For Anaximenes, another Milesian, the primal element from which all is made is air. For his primal element, Heraclitus chose Fire, because unlike Thales's Water and Anaximenes' Air (and of course Earth), Fire is always rapidly changing.

Pythagoras gave Plato the idea that mathematics could supply the most fundamental explanations of reality, namely the Forms, the organization and arrangement of things in the universe. Most other pre-Socratics were focused on material explanations, especially the atomists, Democritus and Leucippus, who were physical determinists, and Epicurus, who agreed about the atoms and void, but made the atoms swerve to add an element of *indeterminism* to events.

Socrates and Plato

Considered as a metaphysicist, Plato's greatest contribution was to promote the Forms or "Ideas." Plato coined the Greek word for idea (ιδέα) from the past tense of the verb "to see." For Plato, ideas are something we have seen when souls made their great circuit of the heavens before coming to Earth.

Plato was inspired by Pythagoras. Other than Pythagoras, whose fundamental understanding of reality was based on mathematics, the other pre-Socratics were all materialists.

Socrates had no interest in the materialists and their physical theories. He wanted to understand the human being and ethical values. He famously insisted that "virtue is knowledge." Anyone doing an evil thing must be doing it out of ignorance of the Good.

Ironically, Socrates spent his life showing that very few, if any, people understand what it is to know anything.

Aristotle

Metaphysics has signified many things in the history of philosophy, but it has not strayed far from a literal reading of "beyond the physical." The term was invented by the 1st-century BCE head of Aristotle's Peripatetic school, Andronicus of Rhodes. Androni-

cus edited and arranged Aristotle's works, giving the name Metaphysics (τα μετα τα φυσικα βιβλια), literally "the books beyond the physics," perhaps the books to be read after reading Aristotle's books on nature, which he called the Physics. The Greek for nature is *physis*, so metaphysical is also "beyond the natural." Proponents of modern naturalism deny the existence of anything metaphysical, which some regard as "supernatural.".

Aristotle never used the term metaphysics. For Plato, Aristotle's master, the realm of abstract ideas was more "real" than that of physical. i.e., material or concrete, objects, because ideas can be more permanent (the Being of Parmenides), whereas material objects are constantly changing (the Becoming of Heraclitus). Where Plato made his realm of ideas the "real world," Aristotle made the material world the source of ideas as mere abstractions from common properties found in many concrete objects. Neoplatonists like Porphyry worried about the existential status of the Platonic ideas. Does Being exist? What does it mean to say "Being Is"?

In recent centuries then, metaphysical has become "beyond the material." Metaphysics has become the study of *immaterial* things, like the mind, which is said to "supervene" on the material brain. Metaphysics is a kind of idealism, in stark contrast to "eliminative" materialism. And metaphysics has failed in proportion to the phenomenal success of naturalism, the idea that the laws of nature alone can completely explain the contents of the universe.

The books of Aristotle that Andronicus considered "beyond nature" included Aristotle's "First Philosophy" — ontology (the science of being), cosmology (the fundamental processes and original causes of physical things), and theology (is a god required as "first cause?").

Aristotle's Physics describes the four "causes" or "explanations" (*aitia*) of change and movement of objects already existing in the universe (the ideal formal and final causes, vs. the efficient and material causes). Aristotle's metaphysics can then be seen as explanations for existence itself. What exists? What is it to be? What processes can bring things into (or out of) existence? Is there a cause or explanation for the universe as a whole?

In critical philosophical discourse, metaphysics has perhaps been tarnished by its Latinate translation as "supernatural," with its strong theological implications. But from the beginning, Aristotle's books on "First Philosophy" considered God among the possible causes of the fundamental things in the universe. Tracing the regress of causes back in time as an infinite chain, Aristotle postulated a first cause or "uncaused cause." Where every motion needs a prior mover to explain it, he postulated an "unmoved first mover." These postulates became a major element of theology down to modern times.

Modern metaphysics is described as the study of the fundamental structure of reality, and as such foundational not only for philosophy but for logic, mathematics, and all the sciences. Some see a need for a foundation for metaphysics itself, called metametaphysics, but this invites an infinite regress of "meta all the way down (or up)."

Aristotle's First Philosophy included theology, since first causes, new beginnings or genesis, might depend on the existence of God. And there remain strong connections between many modern metaphysicians and theologians.

The Stoics

The Stoics divided their philosophy into three parts, logic, ethics, and physics.

Stoic logic included rhetoric, dialectic, grammar, epistemology and a philosophy of language. They developed theories of concepts, propositions, perception, and thought. Their logic was propositional, rather than the Aristotelian logic of syllogisms and predicates. They defined five fundamental logical tools:

if p then q; p; therefore q (*modus ponens*);

if p then q; not q; therefore not-p (*modus tollens*);

either p or q; p; therefore not-q;

either p or q; not p; therefore q;

not both p and q; p; therefore not-q;

They had a strict interpretation of the principle of bivalence (Aristotle's non-contradiction) and the law of the excluded middle. Every statement is either true or false, even statements about the future,

as Diodorus Cronus maintained. But Aristotle denied the present truth or falsity of future statements with his analysis of future contingency (e.g., the Sea Battle).

The Stoic philosophy of language had a theory of signs long before Charles Sanders Peirce's semiotics or Ferdinand de Saussurre's semiology. A signifier is an utterance of a name, a proper noun (*onoma*). The name-bearer is the object or concept that gets signified. The signification consists of the immaterial qualities that they called *lekta*, or 'sayables,' predicates that are true or false of the signified. The sayables are that which subsists (grows and decays), the "peculiar qualifications" of an individual.

Stoic physics included a wide range of topics including ontology, cosmology, theology, psychology, and metaphysics. The basic principles of the universe (Aristotle's *archai*) are two - matter and *pneuma*, a breath or *psyche*. Pneuma combined two of the four fundamental elements, fire and air, representing hot and cold, as the active principle. A passive principle combined earth and water as the basis for material objects. The Stoics regarded matter as "unqualified" and inert. Changes in the material in an object they described as generation and destruction (following Aristotle).

Pneuma is the cause (*aition*) of change in the peculiar qualities of an individual that constitute growth and decay, corresponding to the Platonic and Aristotelian forms and ideas that shape a material object. Pneuma endows the bodies with different qualities as a result. The pneuma of inanimate object is called a 'tenor' (*hexis*, "having"). What it "has" are qualities. Pneuma in plants has a (*phusis*, 'nature'). Pneuma in animals the Stoics called soul (psychê) and in rational animals pneuma includes the commanding faculty (*hêgemonikon*)

The Stoics saw the identity of an individual as its immaterial bundle of properties or qualities that they called the "peculiarly qualified individual" or ἰδίος ποιὸν.

Zeno of Cytium had formulated a psychological theory of how we acquire beliefs that are justified empirically and not by reasoning. To form a belief is to give one's assent to an "impression" (a phenomenal appearance: *phantasia*) about the material substrate of an

object. Some perceptions are 'cognitive' or self-warranting. Assenting to them is a cognition or grasp (*katalêpsis*) of their objects. Assent should be restricted to these cognitive or kataleptic impressions. Cognitive impressions give us infallible knowledge or wisdom. Our beliefs will then be constituted entirely by self-warranting perceptual cognitions. Zeno argued that a cognitive impression "stamps" the form of the object (its peculiar qualities) on our mind or soul (pneuma), just as we now see *immaterial* information embodied in the material brain, experiences recorded in our ERR.

Following Aristotle, the Stoics called the material substance or substrate ὑποκείμενον (or "the underlying"). This material substrate is transformed when matter is lost or gained, but they said it is wrong to call such material changes "growth (αὐξήσεις) and decay (φθίσεις)." The Stoics suggested they should be called "generation (γενέσεις) and destruction (φθορὰς)." These terms were already present in Aristotle, who said that the form, the essence, is not generated. He said that generation and destruction are material changes that do not persist (as does the Stoic peculiarly qualified individual).

> "It is therefore obvious that the form (or whatever we should call the shape in the sensible thing) is not generated—generation does not apply to it—nor is the essence generated; for this is that which is induced in something else either by art or by nature or by potency. But we do cause a bronze sphere to be, for we produce it from bronze and a sphere; we induce the form into this particular matter, and the result is a bronze sphere... For if we consider the matter carefully, we should not even say without qualification that a statue is generated from wood, or a house from bricks; because that from which a thing is generated should not persist, but be changed. This, then, is why we speak in this way." [1]

It is important to see that the Aristotelian view is very similar to the Stoic - that individuals are combinations of matter and form. At times Aristotle made the matter the principle of individuation, at other times he stressed the immaterial qualities or "affections," as did the Stoics, with their peculiarly qualified individual (ἰδίος ποιὸν).

1 Aristotle, *Metaphysics*, Book VII, § vii & viii

Is Aristotle here the source of the four Stoic genera or categories? The term "substance" (οὐσία) is used, if not in more, at least in four principal cases; for both the essence and the universal and the genus are held to be the substance of the particular (ἑκάστου), and fourthly the substrate (ὑποκείμενον). The substrate is that of which the rest are predicated, while it is not itself predicated of anything else. Hence we must first determine its nature, for the primary substrate (ὑποκείμενον) is considered to be in the truest sense substance.

Aristotle clearly sees a statue as an integral combination of its form/shape and its matter/clay, not two distinct things, as Skeptics would claim. Now in one sense we call the matter (ὕλη) the substrate; in another, the shape (μορφή); and in a third, the combination. Both matter and form and their combination are said to be substrate. of the two. By matter I mean, for instance, bronze; by shape, the arrangement of the form (τὸ σχῆμα τῆς ἰδέας); and by the combination of the two, the concrete thing: the statue (ἀνδριάς). Thus if the form is prior to the matter and more truly existent, by the same argument it will also be prior to the combination.[2]

The Academic Skeptics attacked the Stoics, saying Stoics were making single things into dual beings, two objects in the same place at the same time, but indistinguishable.

> ". . . since the duality which they say belongs to each body is differentiated in a way unrecognizable by sense-perception. For if a peculiarly qualified thing like Plato is a body, and Plato's substance is a body, and there is no apparent difference between these in shape, colour, size and appearance, but both have equal weight and the same outline, by what definition and mark shall we distinguish them and say that now we are apprehending Plato himself, now the substance of Plato? For if there is some difference, let it be stated and demonstrated." [3]

Many of the classic metaphysical puzzles are arguments over this dual nature of something as matter and form, especially Dion and Theon, Tibbles, the Cat, The Growing Argument, The Ship of Theseus, and The Statue and the Clay.

2 Aristotle, *Metaphysics*, Book VII, § iii, 1-2

3 Anonymous Academic treatise, Oxyrhynchus Papyrus 3008 in Stoic Ontology, *The Hellenistic Philosophers*, A. Long and D. Sedley, p.167

Modern metaphysicians mistakenly think that matter alone constitutes an entity.

Academic Skeptics

Fundamentally, the Skeptics attempted to deny knowledge, including epistemology and metaphysics.

Arcesilaus, the sixth head or scholarch of the Platonic Academy. Under him, the Academy returned to the Socratic method and engaged in negative dialectics that denied the possibility of knowledge (*akatalêpsia*). Arcesilaus realized that he could not say that he knows nothing without making a knowledge claim. This mitigated absolute skepticism.

The Academic Skeptics refused to accept any philosophical arguments that claimed to justify knowledge. Whatever reasons are used to justify something must themselves be justified, leading to an infinite regress. The Skeptics recommended that their followers therefore suspend (*epochê*) all judgments.

Most of Arcesilaus's best known arguments were dialectical attacks on the Stoics. His major Stoic opponent was Chrysippus, whose philosophy of "assent" was more or less the opposite of Arcesilaus' epochê. Stoic epistemology was more empirical than the logical and rational approach of the Skeptics, which allowed them to generate several dialectical puzzles and paradoxes from the Stoic premises or first principles.

The Scholastics

For medieval philosophers, metaphysics was understood as the science of the supersensible. Albertus Magnus called it science beyond the physical. Thomas Aquinas narrowed it to the rational cognition of God. John Duns Scotus disagreed, arguing that only study of the world can yield knowledge of God. Aquinas and Scotus can be seen as the founders of the great division in philosophy between continental rationalism and British empiricism.

It began as a theological dispute over the freedom of God. Does God have freedom of the will or is God constrained by Reason? If God must be rational, then one can deduce everything about the

world by reasoning in an ivory tower. If God was free to create anything, knowledge requires an empirical investigation of the world.

Scholastic philosophers mostly returned metaphysics to the study of being in itself, that is, ontology, which again today is the core area of metaphysical arguments. In renaissance Germany, Christian Wolff broadened metaphysics to include psychology, along with ontology, cosmology, and natural or rational theology. In renaissance England, Francis Bacon narrowed metaphysics to the Aristotelian study of formal and final causes, separating it from natural philosophy which he saw as the study of efficient and material causes.

Descartes

René Descartes made a turn from what exists to knowledge of what exists. He changed the emphasis from a study of being to a study of the conditions of knowledge or epistemology.

Descartes was the origin of the mind-body problem.[4] He famously divided the world into mind (the ideal realm of thoughts) and body (the material world). For him, the physical world was a deterministic machine, but our ideas and thoughts could be free (undetermined) and could change things in the material world (through the pineal gland in the brain, he thought).

Information philosophy restores an *immaterial* mind to the impoverished and deflated metaphysics that we have had since empiricism and naturalism rejected the dualist philosophy of René Descartes and its troublesome mind-body problem.

Leibniz

Gottfried Leibniz had a vision of a universal ambiguity-free language based on a new symbol set, a *characterica universalis*, and a machine-like *calculus ratiocinator* that would automatically prove all necessary truths, true in "all possible worlds." Gottlob Frege called Leibniz's idea "a system of notation directly appropriate to objects." In the three hundred years since Leibniz had this vision, logical philosophers and linguistic analysts have sought those truths

4 See chapter 15.

in the form of "truth-functional" propositions and statements formulated in words, but they have failed to find any necessarily "true" connection between words and objects.

Information philosophy uses such system of notation, not in words, but in bits of digital information. And the interconnected computers of the Internet are not only Leibniz's *calculus ratiocinator*, but humanity's storehouse of shared experiences and accumulated knowledge. Like the individual *experience recorder and reproducer* (ERR) in each human mind, the World Wide Web is our shared Knowledge Recorder and Reproducer. Computer simulations of physical and biological processes are the best representations of human knowledge about the external world of objects.

Leibniz's *Principle of Sufficient Reason* says that every event has a reason or cause in the prior state of the world. This appears to commit him to a necessary determinism, but like the ancient compatibilist Chrysippus, Leibniz argued that some empirical things are contingent.

Leibniz formulated many logical principles that play a major role in current metaphysical debates.

One is his *Principle of Contradiction* (Aristotle's *Principle of Non-Contradiction*). A proposition cannot be true and false at the same time, and that therefore A is A and cannot be not A.

That A is A follows from what Leibniz called the *Identity of Indiscernibles*, the idea that no differences are perceivable between identical things. This came to be known as Leibniz's Law.

The Metaphysics of Identity

Leibniz calls identity of any object with itself as a primary truth.

> "Primary truths are those which either state a term of itself or deny an opposite of its opposite. For example, 'A is A', or 'A is not not-A'; If it is true that A is B, it is false that A is not B, or that A is not-B'; again, 'Each thing is what it is', 'Each thing is like itself, or is equal to itself, 'Nothing is greater or less than itself—and others of this sort which, though they may have their own grades of priority, can all be included under the one name of 'identities'.

> All other truths are reduced to primary truths by the aid of definitions—i.e. by the analysis of notions; and this constitutes a priori proof, independent of experience. I will give an example. A proposition accepted as an axiom by mathematicians and all others alike is 'The whole is greater than its part', or 'A part is less than the whole'. But this is very easily demonstrated from the definition of 'less' or 'greater', together with the primitive axiom, that of identity. The ' less' is that which is equal to a part of another ('greater') thing. (This definition is very easily understood, and agrees with the practice of the human race when men compare things with one another, and find the excess by taking away something equal to the smaller from the larger.) So we get the following reasoning: a part is equal to a part of the whole (namely to itself: for everything, by the axiom of identity, is equal to itself). But that which is equal to a part of the whole is less than the whole (by the definition of 'less'); therefore a part is less than the whole.[5]
>
> 4. There are no two individuals indiscernible from one another... Two drops of water or milk looked at under the microscope will be found to be discernible. This is an argument against atoms, which, like the void, are opposed to the principles of a true metaphysic.
>
> 5. These great principles of a Sufficient Reason and of the Identity of Indiscernibles change the state of metaphysics, which by their means becomes real and demonstrative; whereas formerly it practically consisted of nothing but empty terms.
>
> 6. To suppose two things indiscernible is to suppose the same thing under two names." [6]

Information philosophy restores the metaphysical existence of a Cartesian realm that is "beyond the natural" in the sense since at least David Hume and Immanuel Kant that the "laws of Nature" completely determine everything that exists, everything that happens, everything that exists in the phenomenal and material world.

5 Leibniz.. 'Primary Truths,' in *Philosophical Writings*, ed. G. H. R. Parkinson, p.87

6 Leibniz. "'Correspondence with Clarke," in *Philosophical Writings*, p.216

While information philosophy is a form of Descartes' idealism/materialism dualism, it is not a substance dualism. Information is a physical, though *immaterial*, property of matter. Information philosophy is a property dualism.

Abstract information is neither matter nor energy, although it needs matter for its embodiment and energy for its communication.

Information is *immaterial*. It is the modern spirit, the ghost in the machine. It is the mind in the body. It is the soul. And when we die, our personal information and its communication perish. The matter remains.

The Empiricists

For empiricists in England like John Locke and David Hume, metaphysics included the "primary" things beyond psychology and the "secondary" sensory experiences. They denied that any knowledge was possible apart from experimental and mathematical reasoning. Hume thought the metaphysics of the Scholastics is sophistry and illusion.

> If we take in 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. Commit it then to the flames: for it can contain nothing but sophistry and illusion.[7]

Hume criticized the Theory of Ideas of his fellow British empiricists John Locke and George Berkeley. If, as they claim, knowledge is limited to perceptions of sense data, we cannot "know" anything about external objects, even our own bodies. But Hume said that we do have a "natural belief" in the external world and causal laws.

Hume's idea of the mind having a "feeling" (not a reason) that leads to natural beliefs became Kant's "second Copernican revolution" that the mind projects "concepts of the understanding" and "forms of perception" on the external world.

7 Hume (1748) *Enquiry Concerning Human Understanding*, section XII

Kant

In Germany, Immanuel Kant's *Critiques of Reason* claimed a transcendental, non-empirical realm he called *noumenal*, for pure, or *a priori*, reason beyond or behind the phenomena. Kant's phenomenal realm is deterministic, matter governed by Newton's laws of motion. Kant's *immaterial noumena* are in the metaphysical non-empirical realm of the "things themselves" along with freedom, God, and immortality. Kant identified ontology not with the things themselves but, influenced by Descartes, what we can think - and reason - about the things themselves. In either case, Kant thought metaphysical knowledge might be impossible for finite minds.

Kant reacted to the Enlightenment, to the Age of Reason, and to Newtonian mechanics (which he probably understood better than any other philosopher), by accepting determinism as a fact in the physical world, which he called the phenomenal world. Kant's goal was to rescue the physical sciences from the devastating and unanswerable skepticism of David Hume, especially Hume's assertion that no number of "constant conjunctions" of cause and effect could logically prove causality.

Kant called Hume's assertion the "*crux metaphysicorum*." If Hume is right, he said, metaphysics is impossible. Kant's *Critiques of Reason* were to prove that Hume was wrong.

Neither Hume's Idea of "natural belief" nor Kant's "concepts of the understanding" are the apodeictic and necessary truths sought by metaphysicians. They are abstract theories about the world, whose information content is validated by experiments. Hume's idea of the mind having a "feeling" (not a reason) that leads to natural beliefs became Kant's "second Copernican revolution" that the mind projects "concepts of the understanding" and "forms of perception" on the external world.

Kant's main change in the second edition of the *Critique of Pure Reason* was an attempted refutation of this British idealism (B 274). He thought he had a proof of the existence of the external world. Kant thought it a scandal in philosophy that we must accept the

existence of material things outside ourselves merely as a belief, with no proof.

> "The only thing which might be called an addition, though in the method of proof only, is the new refutation of psychological idealism, and the strict (and as I believe the only possible) proof of the objective reality of outer intuition. However innocent idealism may be considered with respect to the essential purposes of metaphysics (without being so in reality), it remains a scandal to philosophy, and to human reason in general, that we should have to accept the existence of things outside us (from which after all we derive the whole material for our knowledge, even for that of our inner sense) merely on trust, and have no satisfactory proof with which to counter any opponent who chooses to doubt it." [8]

Kant's noumenal world outside of space and time is a variation on Plato's concept of Soul, Descartes' mental world, and the Scholastic idea of a world in which all times are present to the eye of God. His idea of free will is a most esoteric form of *compatibilism*. Kant's decisions are made in our souls outside of time and only appear determined to our senses, which are governed by our built-in *a priori* forms of sensible perception, like space and time, and built-in categories or concepts of intelligible understanding.

Positivisms

The motto of the information philosopher is "beyond logic and language." Specifically, we must show that logical positivism and logical empiricism, whose attack on metaphysics began as early as Auguste Compte in the early nineteenth century, have done nothing to solve any of the deep problems about the fundamental nature of reality.

Positivism is the claim that the only valid source of knowledge is sensory experience, reinforced by logic and mathematics. Together these provide the empirical evidence for science. Some see this as the "naturalizing" of epistemology.

Ernst Mach's positivism claimed that science consists entirely of "economic summaries" of the facts (the results of experiments). He rejected theories about unobservable things like Ludwig

8 Kant (1787) Preface to Second Edition, *Critique of Pure Reason*, B XL

Boltzmann's atoms, just a few years before Albert Einstein used Boltzmann's own work to prove that atoms exist.

This "linguistic turn" and naturalizing of epistemology can be traced back to Kant and perhaps even to Descartes. The logical positivism of Bertrand Russell and Ludwig Wittgenstein claimed that all valid knowledge must be scientific knowledge, though science is often criticized for "reducing" all phenomena to physical or chemical events. The logical positivists may have identified ontology not with the things themselves but what we can say - using concepts and language - about the things themselves.

The idea that all knowledge can be described by true statements began with Leibniz's vision of a universal ambiguity-free language based on a new symbol set, a *characterica universalis*, and a machine-like *calculus ratiocinator* that would automatically prove all necessary truths, true in "all possible worlds."

In the three hundred years since Leibniz had this vision, logical philosophers and linguistic analysts following Gottlob Frege have sought those truths in the form of "truth-functional" propositions and statements formulated in words, but they have failed to find any necessarily "true" connection between words and objects.

Frege had an enormous influence on Russell, who shared Frege's dream of reducing mathematics, or at least arithmetic, to logic. The great *Principia Mathematica* of Russell and Alfred North Whitehead was the epitome of that attempt. It failed with the discovery of Russell's Paradox and later Gödel's incompleteness proof.

Russell hoped to work with the young Ludwig Wittgenstein to develop the "logical atoms," the simplest propositions, like "red, here, now," upon which more complex statements could be built. He saw the major problems of philosophy as problems of language and logic, that complete understanding of the natural world could be obtained through a complete set of logical propositions.

Wittgenstein's *Tractatus Logico-Philosophicus* was the height of logical positivism - the idea that all knowledge, including all science, can be represented in logically true statements or propositions. The Tractatus includes the first hint of its own failure, with its dark comments about how little can be said.

> "The totality of true propositions is the total natural science (or the totality of the natural sciences)." [9]
>
> "We feel that even if all possible scientific questions be answered, the problems of life have still not been touched at all." [10]

Logical positivists and the logical empiricists of the Vienna Circle not only asserted that all knowledge is scientific knowledge derived from experience, i.e., from verifiable observations, they also added the logical analysis of language as the principal tool for solving philosophical problems. They divided statements into those that are reducible to simpler statements about experience and those with no empirical basis. These latter they called "metaphysics" and "meaningless." While language is too slippery and ambiguous to serve as a reliable tool for philosophical analysis, quantitative information, which underlies all language use, is such a tool.

Logical positivists and empiricists mistakenly claim that physical theories can be logically deduced (or derived) from the results of experiments. A second flaw in all empiricist thinking since Locke et al. is the mistaken idea that all knowledge is derived from experience, written on the blank slate of our minds, etc. In science, this is the flawed idea that all knowledge is ultimately experimental. To paraphrase Kant and Charles Sanders Peirce, theories without experiments may be empty, but experiments without theories are blind.

By contrast, the modern hypothetical-deductive method of science maintains that theories are not the logical (or inductive) consequences of experiments. As Einstein put it, after shaking off his early enthusiasm for Mach's positivistic ideas, theories are "free inventions of the human mind." Theories begin with hypotheses, mere guesses, "fictions" whose value is shown only when they can be confirmed by the results of experiments. Again and again, theories have predicted behaviors in as yet untested physical conditions that have surprised scientists, often suggesting new experiments that have extended the confirmation of theories, which again surprise us. As pure information, scientific knowledge is far beyond the results of experiments alone.

9 Wittgenstein (1922) *Tractatus Logico-Philosophicus*, 4.11

10 *Ibid*, 6.52

Linguistic Analysis

The central figure in the transition from logical empiricism to linguistic analysis was Ludwig Wittgenstein.

Modern anglo-american metaphysicians think problems in metaphysics can still be treated as problems in language, potentially solved by conceptual analysis. They are today still analytical language philosophers, despite a general failure of words to describe objects in any deeply meaningful way. Language is too flexible, too ambiguous and full of metaphor, to be a diagnostic tool for metaphysics. We must go beyond logical puzzles and language games to the underlying information contained in a concept, and in the material things that embody the concept. And it is now transparently obvious that the description of objects, aside from the scientific discovery of the natural laws governing their behavior, is best done with information, with computer simulations and dynamic animations of material objects, both inanimate and living.

Although many metaphysicians claim to be exploring the fundamental structure of reality, the overwhelming fraction of their writings is about problems in analytic linguistic philosophy, that is to say problems with words. Many questions appear to be verbal quibbles. Others lack meaning or have no obvious truth value, dissolving into paradoxes.

Based on current practice, we can sharpen the definition of a metaphysician to be an analytic language philosopher who discusses metaphysical problems.

By contrast, a metaphysicist is an information philosopher who is familiar with modern physics, chemistry, and biology, as well as the interpretation of quantum physics. The fundamental structure of reality today must be built on an understanding of quantum reality.

For example, the wave function of a quantum particle is pure information. Interpretations of quantum mechanics are fundamentally metaphysical, problems for a metaphysicist.

What are we to say about a field of human inquiry whose problems have hardly changed over two millennia? Metaphysicians today still analyze logic and language in the puzzles and paradoxes that

have been used for millennia to wrestle with metaphysical problems. Debates between metaphysicians have changed relatively little in recent centuries, despite great advances in human knowledge.

Most of these problems are the result of assuming that the contents of the universe are pure material. They depend on the idea that material alone constitutes complete knowledge - the identity - of any physical thing.

Analytic language philosophers are largely materialist, even eliminative materialists, many denying the existence of mind, for example. They are also mostly determinist, denying the existence of alternative possibilities in our actual universe, while investing a great deal of their energy in the study of inaccessible possible worlds (in each of which there are also no possibilities, only actuality).

The new light thrown by information philosophy on many metaphysical problems, puzzles, and paradoxes comes from establishing an *immaterial*, yet physical, realm of ideas alongside the material realm. No physical object is completely known without understanding its form in terms of quantifiable information. Information philosophy goes beyond logical puzzles and language games.

Modal Logic

Although the modes of necessity, possibility, and impossibility had been part of Aristotelian logic (indeed, even future contingency was analyzed), Gottlob Frege's logic of propositional functions included only one mode - simple affirmation and denial of statements and the universal and existential quantifiers. Bertrand Russell's *Principia Mathematica* followed Frege and ignored other modalities.

Although the Scholastics considered some questions of modality, it was the Harvard logician C.I. Lewis who advanced beyond Aristotle and developed the first modern version of modal logic. He wrote two textbooks, *A Survey of Symbolic Logic* in 1918 and *Symbolic Logic*, written with C. H. Langford, in 1927.

Lewis was critical of the *Principia* for its non-intuitive concept of "material implication," which allows irrelevant, even false premises *p* to imply any true consequences. Lewis proposed that implication

must include "intensional" and meaningful, even causal, connections between antecedents and consequences, a revision he called "strict implication."

Lewis's inclusion of intension (meaning) was criticized by Willard Van Orman Quine, who thought symbolic logic should be limited to "extensional" arguments, based on the members of classes in a set theory basis for logic. In Quine's 1943 article, "Notes on Existence and Necessity," (revised to appear ten years later as part of the chapter "Reference and Modality" in his landmark book *From a Logical Point of View*, Quine saw no need for "intensional" statements in mathematics. Truth values are all that are needed, he says

> "These latter are intensional compounds, in the sense that the truth-value of the compound is not determined merely by the truth-value of the components...any intensional mode of statement composition...must be carefully examined in relation to its susceptibility to quantification...It is known, in particular, that no intensional mode of statement composition is needed in mathematics." [11]

Quine saw the need for serious restrictions on the significant use of modal operators.[12] Just three years later, Ruth Barcan Marcus, publishing under her maiden name Ruth C. Barcan, added a modal axiom for possibility to the logical systems S2 and S4 of C.I. Lewis. Lewis was pleasedwith her work, although by that time, he had given up his own work on logic.

Quine, however, reacted negatively to Marcus's suggestion in 1946 that modal operators (Lewis's diamond '◊' for possibly, and a box '□ for "necessarily" suggested by Barcan's thesis adviser, F. B. Fitch) could be transposed or interchanged with universal and existential quantification operators (an inverted A '∀' for "for all" and a reversed E '∃' for "for some"), while preserving the truth values of the statements or propositions.

Marcus asserted the commuting of quantification and modal operators in what A.N. Prior called the "Barcan formulas."

$\forall x \Box Fx \supset \Box \forall x Fx.$ $\forall x \Diamond Fx \supset \Diamond \forall x Fx.$

$\exists x \Box Fx \supset \Box \exists x Fx.$ $\exists x \Diamond Fx \supset \Diamond \exists x Fx.$

11 Quine (1943) 'Notes on Existence and Necessity,' in *Journal of Philosophy,* 40 p.123-125

12 *Ibid*., p,127

In his 1943 article, Quine had generated a number of apparently paradoxical cases where truth value is not preserved when "quantifying into a modal context." But these can all be understood as a failure of *substitutivity* for putatively identical entities.

Information philosophy has shown that two distinct expressions that are claimed to be identical are never identical in all respects. So a substitution of one expression for the other may not be identical in the relevant respect. Such a substitution can change the meaning, the intension of the expression. Quine called this "referential opacity." This is a problem that can be solved with unambiguous references.

Frege had insisted that we must look past the reference or designator (his "*Bedeutung*) to the sense ("*Sinn*") of the reference, which is just what Lewis was attempting to do with his attempted addition of intension and "strict" implication..

Perhaps Quine's most famous paradox of referential opacity is this argument about the number of planets:

> "(1) 9 is necessarily greater than 7
> for example, is equivalent to
> '9 > 7' is analytic
> and is therefore true (if we recognize the reducibility of mathematics to logic)..." [13]

Given, say that

(2) The number of planets is 9,

we can substitute 'the number of planets' from the non-modal statement (2) for '9' in the modal statement (1) which gives us the false modal statement

(3) The number of planets is necessarily greater than 7.

But this is false, says Quine, since the statement

(2) The number of planets is 9

is true only because of circumstances outside of logic.

Marcus analyzed this problem in 1961, which she called the "familiar example,"

13 Quine (1943) 'Notes on Existence and Necessity,' p.121

> "(27) 9 eq the number of planets
> is said to be a true identity for which substitution fails in
> (28) □ (9 > 7)
> for it leads to the falsehood
> (29) □ (the number of planets > 7).
> Since the argument holds (27) to be contingent (~□ (9 eq the number of planets)), 'eq' of (27) is the appropriate analogue of material equivalence and consequently the step from (28) to (29) is not valid for the reason that the substitution would have to be made in the scope of the square." [14]

The failure of substitutivity can be understood by unpacking the use of "the number of planets" as a purely designative reference, as Quine calls it.

In (27), "the number of planets" is the empirical answer to the question "how many planets are there in the solar system?" It is not what Ruth Barcan Marcus would call a "tag" of the number 9. The intension of this expression, its reference, is the "extra-linguistic" fact about the current quantity of planets.

The expression '9' is an unambiguous mathematical (logical) reference to the number 9. It refers to the number 9, which is its meaning (intension).

We can conclude that (27) is not a true identity, unless before "the number of planets" is quantified, it is qualified as "the number of planets *qua* its numerosity, as a pure number." Otherwise, the reference is "opaque," as Quine describes it. But this is a problem of his own making.

As Marcus says, when we recognize (27) as contingent, ~□ (9 eq the number of planets), it is not necessary that 9 is equal to the number of planets, its reference to the number 9 becomes opaque.

The substitution of a possible or contingent empirical fact that is not "true in all possible worlds" for a logical-mathematical concept that is necessarily true is what causes the substitution failure.

When all three statements are "in the scope of the square" (□), when all have the same modality, we can "quantify into modal con-

14 Marcu (1961) Modalities and Intensional Languages," p. 313

texts," as Quine puts it. Both expressions, '9' and 'the number of planets, *qua* its numerosity,' will be references to the same thing,

They will be identical in one respect, *qua* number. They will be "referentially transparent."

The Necessity of Identity

In her third article back in 1947, "The Identity of Individuals," Barcan had first proved the necessity of identity. This result became a foundational principle in the modern incarnation of Leibniz's "possible worlds" by Saul Kripke and David Lewis.

Her proof combined a simple substitution of equals for equals and Leibniz's Law.

Quine described this in his 1953 "Reference and Modality" (p.153) as in the form

(x)(y) (x = y) ⊃ □ (x = y),

reading "for all x and for all y, if "x = y," then necessarily "x = y."

Quine found this relationship in the 1952 textbook, *Symbolic Logic*, by F. B. Fitch, who was Ruth Barcan's thesis adviser. Although Fitch mentions her work in his foreword, he does not attribute this specific result to her where he presents it. His proof is based on the assumption of *substitutability*, which he calls "identity elimination."

23.4 (1) a = b, (2) □[a = a], then (3) □[a = b], by identity elimination.[15]

Then in 1961, Marcus published a very brief proof of her claim, using Leibniz's Law relating identicals to indiscernibles.

> "In a formalized language, those symbols which name things will be those for which it is meaningful to assert that I holds between them, where 'I ' names the identity relation... If 'x' and 'y' are individual names then
>
> (1) x I y
>
> Where identity is defined rather than taken as primitive, it is customary to define it in terms of indiscernibility, one form of which is
>
> (2) x Ind y =df (φ)(φx eq φy)" [16]

15 Fitch (1952) *Symbolic Logic*, p.164

16 Marcus (1961) Modalities and Intensional Languages,' p. 305

Statement (2) says that the indiscernibility of x from y, by definition means that for every property φ, both x and y have that same property, φx eq φy.

A few years after Marcus' 1961 presentation, David Wiggins developed a five-step proof of the necessity of identity, using Leibniz' Law, as had Marcus. He did not mention her.

David Wiggins on Identity

David Wiggins and Peter Geach debated back and forth about the idea of "relative identity" for many years after Geach suggested it in 1962.

Ruth Barcan Marcus published her original proof of the necessity of identity in 1947 and repeated her argument at a 1961 Boston University colloquium.

Whether Wiggins knew of Marcus's 1961 presentation is not clear. He should have known of her 1947 paper, and his work is similar to her 1961 derivation (which uses Leibniz's Law). Wiggins gives no credit to Marcus, a pattern in the literature for the next few decades and still seen today ignoring the work of female philosophers.

Saul Kripke clearly modeled much of his four-step derivation after Wiggins, especially his criticism of the derivation as "paradoxical". Kripke gives no credit to either Marcus or Wiggins for the steps in the argument, but his quote from Wiggins, that such a claim makes contingent identity statements impossible, when they clearly are possible, at least tells us he has read Wiggins. And we know Kripke heard Marcus's presentation at the 1961 B. U. colloquium.

Here is Wiggins in 1965,

> "I WANT to try to show (i) that there are insuperable difficulties any term + relation + term or subject + predicate analysis of statements of identity, (ii) that, however important and helpful the sense-reference distinction is,[1] this distinction does not make it possible to retain the relational or predicative analysis of identity statements, and (iii) that a realistic and radically new account is needed both of ' = ' and of the manner in which noun-phrases occur in identity-statements.
>
> Till we have such an account many questions about identity

and individuation will be partly unclear, and modal logics will continue without the single compelling interpretation one might wish.

The connexion of what I am going to say with modal calculi can be indicated in the following way. It would seem to be a necessary truth that if a = b then whatever is truly ascribable to a is truly ascribable to b and vice versa (Leibniz's Law). This amounts to the principle

(1) (x)(y)((x = y) ⊃ (φ)(φx ⊃ φy))

Suppose that identity-statements are ascriptions or predications.! Then the predicate variable in (1) will apparently range over properties like that expressed by '(= a)'[2] and we shall get as consequence of (1)

(2) (x) (y) ((x = y) ⊃ (x = x . ⊃ . y = x))

There is nothing puzzling about this. But if (as many modal logicians believe), there exist de re modalities of the form

□ (φa) (i.e., necessarily (φa)),

then something less innocent follows. If '(= a) ' expresses property, then '□ (a=a)', if this too is about the object a, also ascribes something to a, namely the property □ (= a). For on a naive and pre-theoretical view of properties, you will reach an expression for a property whenever you subtract a noun-expression with material occurrence (something like ' a ' in this case) from a simple declarative sentence. The property

□ (= a) then falls within the range of the predicate variable in Leibniz's Law (understood in this intuitive way) and we get

(3) (x) (y) (x = y ⊃ (□ (x = x). ⊃. □(y = x)))

Hence, reversing the antecedents,

(4) (x) (y) (□ (x = x). ⊃. (x = y) ⊃ □(x = y))

But (x) (□ (x=x)) ' is a necessary truth, so we can drop this antecedent and reach

(5) (x)(y)((x = y). ⊃ . □(x = y))

Now there undoubtedly exist contingent identity-statements. Let 'a = b' be one of them. From its simple truth and (5) we can derive '□(a = b)'. But how then can there be any contingent identity-statements?...

1 G. Frege, 'On Sense and Reference ', Translations from the Philosophic Writings of Gottlob Frege, ed. P. T . Geach and M. Black (Oxford, 1952), pp. 56-4]

2 Quotation marks are used under the convention that they serve to form a designation of whatever expression would result in a particular case from rewriting the expression within the quotation-marks with genuine constants in the place of free variables and dummy-expressions." [17]

Saul Kripke on Identity

Kripke does not cite Wiggins directly as the source of the argument, but just after his exposition above, Kripke quotes David Wiggins as saying in his 1965 "Identity-Statements"

> Now there undoubtedly exist contingent identity-statements. Let a = b be one of them. From its simple truth and (5) [= (4) above] we can derive '□(a = b)'. But how then can there be any contingent identity statements?[18]

Kripke goes on to describe the argument about b sharing the property " = a" of being identical to a, which we read as merely self-identity, and so may Kripke.

> "If x and y are the same things and we can talk about modal properties of an object at all, that is, in the usual parlance, we can speak of modality *de re* and an object necessarily having certain properties as such, then formula (1), I think, has to hold. Where x is any property at all, including a property involving modal operators, and if x and y are the same object and x had a certain property F, then y has to have the same property F. And this is so even if the property F is itself of the form of necessarily having some other property G, in particular that of necessarily being identical to a certain object. [viz., = x]
>
> Well, I will not discuss the formula (4) itself because by itself it does not assert, of any particular true statement of identity, that it is necessary. It does not say anything about statements at all. It says for every object x and object y, if x and y are the same object, then it is necessary that x and y are the same object. And this, I think, if we think about it (anyway, if someone does not think so, I will not argue for it here), really amounts to something very little different from the statement (2). Since

17 Wiggins (1965) Identity Statements,' in *Analytical Philosophy* pp.40-41

18 Kripke (1971) 'Identity and Necessity,' p. 136

> x, by definition of identity, is the only object identical with x, "(y)(y = x ⊃ Fy)" seems to me to be little more than a garrulous way of saying 'Fx' and thus (x) (y)(y = x ⊃ Fx) says the same as (x)Fx no matter what 'F' is — in particular, even if 'F' stands for the property of necessary identity with x. So if x has this property (of necessary identity with x), trivially everything identical with x has it, as (4) asserts. But, from statement (4) one may apparently be able to deduce various particular statements of identity must be necessary and this is then supposed to be a very paradoxical consequence." [19]

The indiscernibility of identicals claims that if x = y, then x and y must share all their properties, otherwise there would be a discernible difference. Now Kripke argues that one of the properties of x is that x = x, so if y shares the property of '= x," we can say that y = x. Then, necessarily, x = y.

However, two distinct things, x and y, cannot be identical, because there is some difference in extrinsic external information between them. Instead of claiming that y has x's property of being identical to x ("= x") , we can say only that y has x's property of being self-identical, thus y = y. Then x and y remain distinct in at least this intrinsic property as well as in extrinsic properties like their distinct positions in space.

David Lewis on Identity

David Lewis, the modern metaphysician who built on Leibniz' possible worlds to give us his theory of "modal realism," is just as clear as Leibniz on the problem of identity.

> "[W]e should not suppose that we have here any problem about identity. We never have. Identity is utterly simple and unproblematic. Everything is identical to itself; nothing is ever identical to anything else except itself. There is never any problem about what makes something identical to itself, nothing can ever fail to be. And there is never any problem about what makes two things identical; two things never can be identical." [20]

Except, says an information philosopher, "in some respects."

19 Kripke (1971) 'Identity and Necessity,' p. 137-138

20 Lewis (1988) 'Counterparts or Double Lives,' *On the Plurality of Worlds*, p.192

Modal Logic and Possible Worlds

In the "semantics of possible worlds," necessity and possibility in modal logic are variations of the universal and existential quantifiers of non-modal logic. Necessary truth is defined as "truth in all possible worlds." Possible truth is defined as "truth in some possible worlds." These abstract notions about "worlds" – sets of propositions in universes of discourse – have nothing to do with physical possibility, which depends on the existence of real contingency.

Propositions in modal logic are required to be true or false. Contingent statements that are neither true or false are not allowed. So much for real possibilities, which cannot be based on truths in some possible worlds.

Historically, the opposition to metaphysical possibility has come from those who claim that the only possible things that can happen are the actual things that do happen. To say that things could have been otherwise is a mistake, say eliminative materialists and determinists. Those other possibilities simply never existed in the past. The only possible past is the past we have actually had.

Similarly, there is only one possible future. Whatever will happen, will happen. The idea that many different things can happen, the reality of modality and words like "may" or "might" are used in everyday conversation, but they have no place in metaphysical reality. The only "actual" events or things are what exists. For "presentists," even the past does not exist. Everything we remember about past events is just a set of "Ideas." And philosophers have always been troubled about the ontological status of Plato's abstract "Forms," entities like the numbers, geometric figures, mythical beasts, and other fictions.

Traditionally, those who deny possibilities in this way have been called "Actualists."

In the last half-century, one might think that metaphysical possibilities have been restored with the development of modal logic. So-called modal operators like "necessarily" and "possibly" have been added to the structurally similar quantification operators "for all" and "for some." The metaphysical literature is full of talk about "possible worlds."

The most popular theory of "possible worlds" is David Lewis's "modal realism," an infinite number of worlds , each of which is just as actual (eliminative materialist and determinist) for its inhabitants as our world.

It comes as a shock to learn that every "possible world" is just as actual, for its inhabitants, as our world is for us. There are no alternative possibilities, no contingency, that things might have been otherwise, in any of these possible worlds. Every world is as physically deterministic as our own.

Modal logicians now speak of a "rule of necessitation" at work in possible world semantics. The necessarily operator ' □ ' and the possibly operator ' ◊ ' are said to be "duals" - either one can be defined in terms of the other (□ = ~◊~, and ◊ = ~□~), so either can be primitive. But most axiomatic systems of modal logic appear to privilege necessity and de-emphasize possibility. They rarely mention contingency, except to say that the necessity of identity appears to rule out contingent identity statements.

The rule of necessitation is that "if p, then necessarily p," or p ⊃ □p. It gives rise to the idea that if anything exists, it exists necessarily. This is called "necessitism." The idea that if two things are identical, they are necessarily identical, was "proved" by Ruth Barcan Marcus in 1947, by her thesis adviser F.B.Fitch in 1952, and by Willard Van Orman Quine in 1953. David Wiggins in 1965 and Saul Kripke in 1971 repeated the arguments, with little or no reference to the earlier work.

This emphasis on necessitation in possible-world semantics leads to a flawed definition of possibility that has no connection with the ordinary and technical meanings of possibility.

Modal logicians know little if anything about real possibilities and nothing at all about possible physical worlds. Their possible worlds are abstract universes of discourses, sets of propositions that are true or false. Contingent statements, that may be true or false, like statements about the future, are simply not allowed.

They define necessary propositions as those that are "true in all possible worlds." Possible propositions are those that are only "true in some possible worlds." This is the result of forcing the modal

operators □ and ◊ to correspond to the universal and existential quantification operators for all ∀ and for some ∃. But the essential nature of possibility is the conjunction of contingency and necessity. Contingency is not impossible and not necessary (~~◊ ∧ ~□).

We propose the existence of a metaphysical possibilism alongside the notion necessitism.

"Actual possibilities" exist in minds and in quantum-mechanical "possibility functions" It is what call "actual possibilism," the existence in our actual world of possibilities that may never become actualized, but that have a presence as abstract entities that have been embodied as ideas in minds. In addition, we include the many possibilities that occur at the microscopic level when the quantum-mechanical probability-amplitude wave function collapses, making one of its many possibilities actual.

Actual possibles can act as causes when an agent chooses one as a course of action.

Why Modal Logic Is Not Metaphysics

Modal logicians from Ruth Barcan Marcus to Saul Kripke, David Lewis, and the necessicist Timothy Williamson are right to claim metaphysical necessity as the case in the purely abstract informational world of logic and mathematics. But when information is embodied in concrete matter, which is subject to the laws of quantum physics and ontological chance, the fundamental nature of material reality is contingent and possibilist.

There are two reasons for the failure of modal logic to represent metaphysical reality. The first is that information is vastly superior to language as a representation of reality. The second is that truths and necessity cannot be the basis for metaphysical possibility.

Possible world semantics is a way of talking about universes of discourse - sets of true propositions - that considers them "worlds." It may be the last gasp of the attempt by logical positivism and analytic language philosophy to represent all knowledge of objects in terms of words.

Ludwig Wittgenstein's core idea from the Tractatus had the same goal as Gottfried Leibniz's ambiguity-free universal language,

> The totality of true propositions is the total natural science (or the totality of the natural sciences).[21]

Information philosophy has shown that the meaning of words depends on the experiences recalled in minds by the Experience Recorder and Reproducer. Since every human being has a different set of experiences, there will always be variations in meaning about words between different persons, as Gottlob Frege pointed out.

The goal of intersubjective agreement in an open community of inquirers hopes to eliminate those differences, but representation of knowledge in words will always remain a barrier and source of philosophical confusion. The physical sciences use analytic differential equations to describe the deterministic and continuous time evolution of simple material objects, which is a great advance over ambiguous words. But these equations fail at the quantum level and where discrete digital messages are being exchanged between biological interactors. Moreover, while mathematical methods are precise, their significance is not easily grasped.

The very best representation of knowledge is with a dynamic and interactive model of an information structure, what Wittgenstein imagined as a "picture of reality." Today that is a three-dimensional model implemented in a digital computer with a high-resolution display, even a virtual reality display. While computer models are only "simulations" of reality, they can incorporate the best "laws" of physics, chemistry, and biology. And since computer models are pure information, abstract ideas, they seem "beyond physical" and reaching the metaphysical.

Sadly, modal logicians have never proposed more than a handful of specific propositions for their possible worlds, and many of these generated controversies, even paradoxes, about substitutivity of presumed identicals in modal contexts. Word and object have degenerated to words and objections. By comparison, molecular models of the biological machines that have evolved to keep us alive and let us think can be "shown," not said, as Wittgenstein imagined.

21 Wittgenstein (1922) *Tractatus Logico-Philosophicus*, 4.11

His later work can be summed up as the failure of language to be a picture of reality. Information philosophy gives us that picture, not just a two-dimensional snapshot, but a lifelike animation and visualization of the fundamental nature of metaphysical reality.

Our information model incorporates the irreducible ontological chance and future contingency of quantum physics. The claimed "necessity of identity," and the "necessary a posteriori" of natural and artificial digital "kinds" with identical intrinsic information content are just more "ways of talking." There is no necessity in the physical world.

Truths and necessity are ideal concepts "true in all possible worlds," because they are independent of the physical world. They have great appeal as eternal ideas and "outside space and time."

Possible worlds semantics defines necessity as "propositions true in all possible worlds" and possibility as "propositions true in some possible worlds." There is no contingency here, as the only allowed propositions are either true or false. Modal logicians have little knowledge of our actual physical world and zero factual knowledge, by definition, of other possible worlds. The possible worlds of "modal realism" are all actual worlds, deterministic and eliminatively materialist. There are no possibilities in possible worlds, even in the "many worlds" of physics.

A necessicist metaphysics is only a half-truth. Without metaphysical possibility, we cannot account for the information in the universe today, nor can we explain the cosmic, biological, and human creation of new information in our free and open future.

Necessitism and possibilism are perhaps another congruence with the great duals of idealism and materialism.

The Return of Metaphysics and Its Paradoxes

In the last few decades, metaphysicians have celebrated the failures of logical positivists and logical empiricists, especially their loud claims that metaphysics is nonsense or meaningless.

The sad failure of analytic language philosophy to solve any meaningful problems in philosophy has also encouraged a number of philosophers to return to metaphysical questions.

But can they make any progress on the fundamental nature of reality if their tools are still only logic and language analysis? The information philosopher thinks not. We must go beyond logical puzzles and language games to underlying information structures.

Now academic philosophers have never failed to teach all the classic problems, paradoxes, and puzzles, mostly presenting them as insoluble, which gives them a form of job security, but this must be discouraging for would-be future philosophers.

The well-known lack of progress in philosophy compared to the advances in knowledge made in the sciences is more than an embarrassment, it is in some cases a scandal, as the information philosopher has tried to show.

Even in the sciences, the deference shown to philosophers by the special sciences, when it comes to the fundamental nature of reality, has held back those sciences.

Notably, the deep belief in natural laws that are deterministic has held back the essential role of chance in physics and biology. The claims of eliminative materialism have held back progress on the mind-body problem and the free will problem in psychology.

Indirectly caused by philosophical views, these are scandals in the special sciences themselves. The philosophical notion that many genuine problems about reality must be taught as mysteries, not only paradoxes and puzzles, is a disservice to generations of students, who come away not only confused, but ill-informed.

Consider these negative comments from a recent important study of *metametaphysics*, the foundations of metaphysics itself.

> "When one is first introduced to a dispute that falls within the purview of metaphysics — or perhaps even after years of thinking hard about it — one can experience two sorts of deflationary intuitions. First one may sense that nothing is really at issue between the disputants. The phenomenology here resembles that of countering merely 'verbal' or 'terminological' disputes in ordinary conversation...
>
> We come now to the second type of intuition that is elicited by metaphysical disputes. Even when we sense that something might really be at issue when it comes to a question of

> metaphysics, we may still get the impression that the answer is more or less *trivial* —it can be known by drawing out consequences of truisms that we all accept or by reflecting on a conceptual framework that we all share.
>
> These two deflationary intuitions threaten the robustly realist approach that is dominant today — at least among analytic philosophers who specialize in metaphysics, Most contemporary metaphysicians think of themselves as concerned, not primarily with the representations of language and thoughts, but with the reality that is represented." [22]

Information philosophy hopes to *reinflate* metaphysics by adding back the *immaterial* ideas that have been eliminated by naturalists and materialists, with their claims that the world is *causally closed*.

Information physics shows that the universe is open, continually expanding and generating creative new possibilities for the future.

Careful analysis of the information content (the abstract form that shapes a concrete object, arranging its parts) has given us plausible solutions for several classic paradoxes and puzzles in metaphysics.

Information is neither matter nor energy, although it needs matter for its embodiment and energy for its communication. It is *immaterial*. It is the modern spirit, the ghost in the machine.

Living things use information to control the flows of matter and energy through their bodies. Information is the mind in the body. It is the soul. And when we die, our personal information and its communications perish. The matter remains.

22 Chalmers, et al., (2009) *Metametaphysics*, pp.1-3 *passim*.