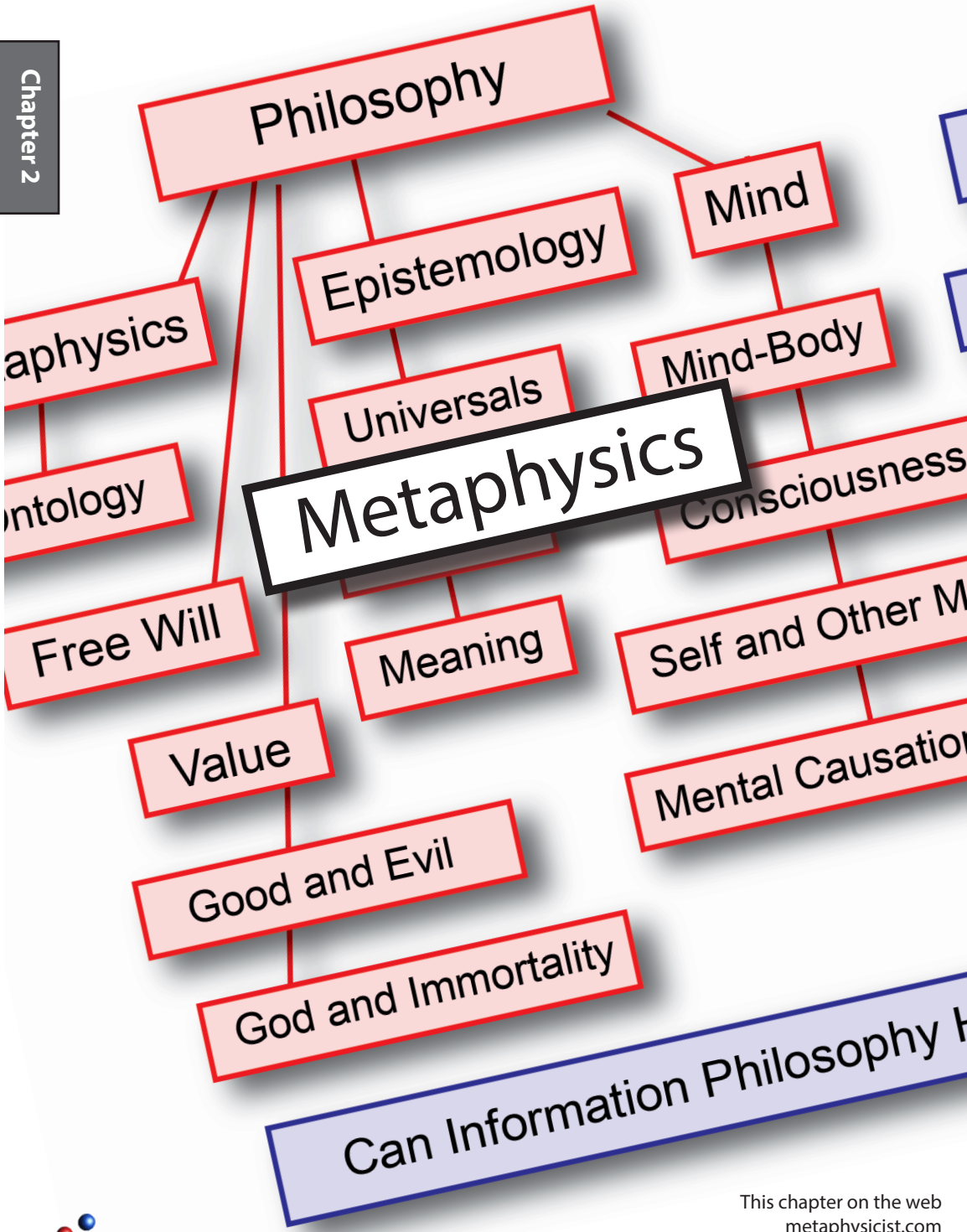

This chapter on the web
metaphysicist.com
informationphilosopher.com/problems/metaphysics

Metaphysics

We apply methods of information philosophy to metaphysics and find solutions to several classic problems, puzzles and paradoxes. You can find them all on our new website **metaphysicist.com** and in our forthcoming book *Metaphysics*. In this chapter, we discuss just a few of them, absolute and relative identity, the problem of composition (parts/wholes), coinciding objects (colocation), Aristotelian essentialism, the need for metaphysical possibility, and the semantics and modal logic of "possible worlds."

Many ancient puzzles are variations on the problem of coinciding objects, including Dion and Theon, the Growing Argument, and the Statue and the Clay. We solve these puzzles.

A central problem in information philosophy is the existential or ontological status of ideas. The *creation* of new ideas requires the existence of ontological chance. Metaphysical *possibility* must therefore be a fundamental aspect of metaphysical reality.

Information provides a unique explanation of self-identity and the *relative* identity of numerically distinct objects. It also explains the existential status of abstract entities.

Metaphysics is an abstract human invention about the nature of concrete reality – *immaterial* thoughts about material things. Information philosophy explains the metaphysics of chance and possibilities, which always underlie the creation of new information. Without metaphysical possibilities, there can be no human creativity and no new knowledge.

A materialist metaphysics asks questions about the underlying substrate presumed to *constitute* all the objects in the universe. Unfortunately, most modern philosophers are eliminative materialists and determinists who think there is "nothing but" the substrate of matter. As Jaegwon Kim puts it,

> "bits of matter and their aggregates in space-time exhaust the contents of the world. This means that one would be embracing an ontology that posits entities other than material substances — that is, immaterial minds, or souls, outside physical space, with immaterial, non-physical properties."[1]

1 *Physicalism, or Something Near Enough. p.71*

A formalist or idealist metaphysics asks about the *arrangement* and *organization* of matter that shapes material objects, what brings their forms into existence, and what causes their changes in space and time. Information philosophy defends a Platonic realm of *immaterial* ideas in a property dualism with the realm of matter. The information realm is physical and natural. It is not supernatural and "outside space and time." Ideas are embodied in matter and use energy for their communication. But they are neither matter nor energy. They are forms that inform.

The total amount of matter (and energy) in the universe is a conserved quantity. Because of the universe expansion, there is ever more room in space for each material particle, ever more ways to arrange the material, ever more possibilities. The total information in the universe is constantly increasing. This is the *first* contribution of information philosophy to metaphysics.

The *second* contribution is to restore a *dualist* idealism, based on the essential importance of information communication in all living things. Since the earliest forms of proto-life, information stored in each organism has been used to create the following generations, including the variations that have evolved to become thinking human beings who have invented the world of ideas that contains metaphysics. Abstract information is an essential, if *immaterial*, part of reality. Plato was right that his "ideas" (ἰδέας) are real. Plato's forms inform.

A *third* contribution from information philosophy adds biology to the analysis of metaphysical problems which began in puzzles over change and growth. The parts of living things – we call them biomers – are communicating with one another, which integrates them into their "wholes" in a way impossible for mere material parts – we find a *biomereological essentialism*.

The arrangement of individual material particles and their interaction is abstract immaterial information. The metaphysics of information can explain the cosmic creation process underlying the origin of all information structures in the universe and the communication of information between all living things, which

we will show use a meaningful biological language, consisting of arbitrary symbols. Biological communications have evolved to become human language.

Ontology asks the question "what is there?"

Eliminative materialism claims that nothing exists but material particles, which makes many problems in ancient and modern metaphysics difficult if not insoluble. To be sure, we are made of the same material as the ancient metaphysicians. With every breath we take, we inspire 10 or 20 of the fixed number of molecules of air that sustained Aristotle. We can calculate this because the material in the universe is a constant.

But information is not a fixed quantity. The stuff of thought and creativity, information has been increasing since the beginning of the universe. There is ever more knowledge (but relatively little increase in wisdom?) With hundreds if not thousands of times as many philosophers as ancient Greece, can we still be debating the same ancient puzzles and paradoxes?

Information philosophy restores so-called "non-existent objects" to our ontology. Abstract entities consist of the same kind of information that provides the structure and process information of a concrete object. What we call a "concept" about an object is some subset of the immaterial information in the object, accurate to the extent that the concept is isomorphic to that subset.

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. But words and names are not enough. 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 a dual parallel to the material substrate that the Greeks called ὑποκείμενον - the "underlying." It gives matter its form and shape. Form informs.

Much of formal metaphysics is about necessary relationships between universal ideas, certain knowledge that we can believe independent of any experience, knowledge that is "a priori" and "analytic" (true by logic and reason alone, or by definition). Some of these ideas appear to be unchanging, eternal truths in any possible world.

Information philosophy now shows that there is no necessity in the natural world. Apodeictic certainty is just an idea. There is no *a priori* knowledge that was not first discovered empirically (*a posteriori*). Only after a fact is discovered do we see how to demonstrate it logically as *a priori*. And everything analytic is part of a humanly constructed language, and thus synthetic. All such "truths" are philosophical inventions, mere concepts, albeit some of the most powerful ideas ever to enter the universe.

There is no necessity in the natural world

Most important, a formal and idealistic metaphysics is about abstract entities, in logic and mathematics, some of which seem to be true independent of time and space. Aristotle, the first metaphysician, called them "first principles" (*archai*, *axioma*). Gottfried Leibniz said they are true in all possible worlds, which is to say their truth is independent of the world.

But if these abstract metaphysical truths are not material, where are these ideas in our world? Before their discovery, they subsisted as unknown properties. Once invented and discovered to be empirical facts, they are embedded in material objects, artifacts, and minds – the software in our hardware. Those ideas that are invented but not found empirically "real" (imagined fictions, flawed hypotheses, round squares) are also added to the sum of human knowledge, even if never embodied.

Many unchanging abstract entities share a property that the early philosophers Parmenides, Plato, and Aristotle called "Being," to distinguish its nature from "Becoming," the property of all material objects that change with time. Certain truths cannot possibly change. They are eternal, "outside space and time."

It is unfortunate that information philosophy undermines the logical concepts of metaphysical necessity, certainty, the *a priori* and analytic, even truth itself, by limiting their analyticity to the unchanging abstract entities in the realm of Being. But, on the positive side, information philosophy now establishes the metaphysical possibility of ontological possibilities.

Possibilities depend on the existence of irreducible ontological chance, the antithesis of *necessity*. Without metaphysical possibilities, no new information can be created.

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

Naturalism is a materialism. Just as existentialism is a humanism. Even stronger, naturalism is an eliminative materialism. It denies the immaterial and particularly the mental.

While information philosophy is a form of the great dualism of idealism versus materialism, 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.

Information is the underlying currency of all communication and language. Passive material objects in the universe contain

information, which metaphysicians and scientists analyze to understand everything material. But passive material objects do not create, actively communicate, and process information, as do all living things.

Realism is the ontological commitment to the existence of material things. Information realism is equally committed to the existence or subsistence of *immaterial*, but physical, ideas.

Human language is the most highly evolved form of information communication in biology. But even the simplest organisms signal their condition and their needs, both internally among their smallest parts and externally as they compete with other living things in their environment.

Biosemioticians convincingly argue that all the messages in biology, from the intracellular genetic codes sent to the ribosomes to produce more of a specific protein, to the words in sentences like this one, are a meaningful part of one continuously evolving semantic system. All messaging is as purposeful as a human request for food, so biology is called *teleonomic*, though not teleological. This "telos" or purpose in life did not pre-exist life.[2]

Like human language, the signs used in biological messages can be symbolic and arbitrary, having no iconic or indexical or any other intrinsic relation between a signifier and the signified concept or object. Like human signs, the meaning of a biological sign is highly dependent on the context. Only four neurotransmitters act as primary messengers sent to a cell, inside of which one of dozens of secondary messengers may be activated to determine the use inside the particular cell - the ultimate Wittgensteinian "meaning as use" in the message.

Modern Anglo-American metaphysicians think problems in metaphysics can be treated as problems in language, potentially solved by conceptual analysis. They are analytical language philosophers. But language is too flexible, too ambiguous and full of metaphor, to be a diagnostic tool for metaphysics. We must go beyond language games and logical puzzles to the underlying information contained in a concept or object.

2 See Appendix G on Biosemiotics.

Information philosophy restores the metaphysical existence of a 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, in the phenomenal and material world.

Although the immaterial realm of information is not "supernatural" in any way, the creation of information throws considerable light on why so many humans, though few scientists, believe – correctly as it turns out – that there is a *providential* force in the universe.[3]

Martin Heidegger, the philosopher of "Being," called Friedrich Nietzsche the "last metaphysician." Nietzsche thought that everything in his "*lebensphilosophie*" was the creation of human beings. Indeed, when we are creative, what we create is new information.

Did we humans "discover" the abstract ideas, or did we "invent" them and then find them to be true of the world, including those true in any possible world?

As opposed to an analytic language metaphysician, a metaphysicist searches for answers in the analysis of immaterial (but physical) information that can be *seen* when it is embodied in external material information structures. Otherwise it can only be *known* – in minds.

Metaphysical truths are pure abstract information, subsisting in the realm of ideas.

Metaphysical facts about the world are discovered when there are isomorphisms between abstract ideas and the concrete structures in the external world that embody those ideas.

Information philosophy bridges the ideal and material worlds of Plato and Aristotle and the noumenal and phenomenal worlds of Kant. It demonstrates how *immaterial* minds are a *causal* force in the material world, connecting the psychological and phenomenological with the "things themselves," which are seen as embodiments of our ideas.

3 See chapter 7.

The causal force of ideas, combined with the existence of alternative possibilities, is the information philosophy basis for human free will.

What are we to say about a field of human inquiry whose major problems have hardly changed over two millennia? Information philosophy looks at a wide range of problems in metaphysics, situating each problem in its historical framework and providing accounts of the best work by today's metaphysicians. Metaphysicians today are analytic language philosophers, some of whom work on a surprisingly small number of metaphysical problems that began as puzzles and paradoxes over two thousand years ago.

The *metaphysicist* adds biological knowledge and quantum physics to help investigate the fundamental nature of reality. David Wiggins called for the former and E. Jonathan Lowe called for the latter. David Chalmers thinks information may help solve the "hard problem" of consciousness.

An information-based metaphysics provides a single explanation for the origin and evolution of the universe as well as life on Earth. Since the beginning, it is the creation of material information structures that underlies all possibilities. From the first living thing, biological communication of information has played a causal role in evolution.

Metaphysics must include both the study of matter and its *immaterial* form. A quantum particle is pure matter. The quantum wave function is pure abstract information about possibilities.

The metaphysics of possibility grounds the possibility of metaphysics.

Possibility 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 in modal logic!

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 the 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" used in everyday conversation, 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 alternative possibilities in this way have been called "Actualists."

Reading the last half-century with the development of modal logic, one might think that metaphysical possibilities have been restored. 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 is for us.

There are no genuine possibilities in Lewis's "possible worlds"! 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, no things that might

have been otherwise, in any of these possible worlds. Every world is as physically deterministic as our own.

There are no possibilities in David Lewis's possible worlds

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, 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." 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. The "necessity of identity" 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.

Naming and Necessity

Perhaps Kripke's most famous work is his idea that proper names are "rigid designators" that are necessarily true in all possible worlds. That is to say, the same individual in other possible worlds must have exactly the same name. This raises the question of "trans-world identity." Must every possible property of any individual be exactly the same? According to Leibniz's Law, which Kripke uses, two entities are only identical if every property they have is identical. So far, so good. But what about the property of being in two different worlds, two different places? If that one property differs, why shouldn't many other propeties, including their names?

Kripke and Hilary Putnam famously asked whether the word "water" and the molecular formula H_2O are necessarily the same in all possible worlds, because water is a "natural kind?"

There is simply no necessity in the physical world, neither the actual world nor "possible" other worlds. Necessitism exists only in the ideal worlds of logic and mathenatics.

The emphasis on necessitation in possible-world semantics leads to a flawed definition of possibility, one that has no connection with the ordinary and scientific 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 discourse, sets of propositions that are true or false. Contingent statements, that may be either true or false, like statements about the future, are simply not allowed in systems of formal logic.

Modal logicians 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 'necessarily' and 'possibly' 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 defined as the not impossible and the not necessary.

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

"Actual possibilities" exist in minds and in quantum-mechanical "possibility functions" It is what we might 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

Although there are no genuine possibilities in Lewis's "possible worlds," we can explain the existence of "actual possibles" in metaphysical terms using the possible world semantics of Saul Kripke,

who maintained that his semantics could be used to describe various ways our actual world might have been. Unlike many other "possible world" interpretations, Kripke accepts that empirical facts in the physical world are contingent, that many things might have been otherwise. Kripke's *counterfactuals* are genuinely different ways the actual world might have been or might become.

> I will say something briefly about 'possible worlds'. (I hope to elaborate elsewhere.) In the present monograph I argued against those misuses of the concept that regard possible worlds as something like distant planets, like our own surroundings but somehow existing in a different dimension, or that lead to spurious problems of 'transworld identification'. Further, if one wishes to avoid the Weltangst and philosophical confusions that many philosophers have associated with the 'worlds' terminology, I recommended that 'possible state (or history) of the world', or 'counterfactual situation' might be better. One should even remind oneself that the 'worlds' terminology can often be replaced by modal talk—'It is possible that . . .'
>
> 'Possible worlds' are total 'ways the world might have been', or states or histories of the entire world.[4]

Following Kripke, we build a model structure **M** as an ordered triple <**G**, **K**, **R**>. **K** is the set of all "possible worlds," **G** is the "actual world," **R** is a reflexive relation on **K**, and **G** ε **K**.

If **H1**, **H2**, and **H3** are three possible worlds in **K**, **H1**R**H2** says that **H2** is "possible relative to" or "accessible from" **H1**, that every proposition true in **H2** is possible in **H1**.

Indeed, the **H** worlds and the actual world **G** are all mutually accessible and each of these is possible relative to itself, since **R** is reflexive.

Now the model system **M** assigns to each atomic formula (propositional variable) P a truth-value of T or F in each world **H** ε **K**.

Let us define the worlds **H1**, **H2**, and **H3** as identical to the real world **G** in all respects except the following statements describing actions of a graduating college student Alice deciding on her next step.

4 *Naming and Necessity*, p. 15, 18

In **H1**, the proposition "Alice accepts admission to Harvard Medical School" is true, but false in other worlds, so "possible."

In **H2**, the proposition "Alice accepts admission to MIT" is true.

In **H3**, the proposition "Alice postpones her decision and takes a 'gap year'" is true.

At about the same time, in the actual world **K**, the statement "Alice considers graduate school" is true.

Note that the abstract information that corresponds to the three possible worlds **H** is embodied physically in the matter (the neurons of Alice's brain) in the actual world and in the three possible worlds. There is no issue with the "transworld identity" of Alice as there would be with Lewis's "modal realism," because all these possible worlds are in the same spatio-temporal domain.

The metaphysical question is which of the three possible worlds becomes the new actual world, say at time *t*. What is the fundamental structure of reality that supports the simultaneous existence of alternative possibilities?

Just before time *t*, we can interpret the semantics of the model structure **M** as saying that the above statements were "merely possible" thoughts about future action in Alice's mind.

Note also that just after the decision at time *t,* the three possible alternatives remain in Alice's experience recorder and reproducer as memories.

Some consequences of Alice's alternative possible decisions.

In the future of world **H1**, Alice's research discovers the genetic signals used in messaging by cancer cells and cancer is eliminated. Several hundred million lives are saved (extended) in Alice's lifetime.

In the future of world **H2**, Alice engineers the miniaturization of nuclear weapons so they are small enough to be delivered by tiny drones. One is stolen from an air force base by a terrorist and flown to an enemy country where millions of lives are lost. Alice kills herself the next day.

In the future of world **H3**, a mature Alice returns to school, completes her Ph.D. in Philosophy at Princeton and writes a book titled *Free Will and Moral Responsibility*.

Actualism

Actualism appeals to philosophers who want the world to be determined by physical laws and by theologians who want the world to be in the hands of an omnipotent, omniscient, and benevolent god.

Some physicists think the future is causally closed under deterministic laws of nature and the "fixed past." If the knowledge that a Laplacian "super-intelligence" could gather about all the motions of material particles at a single instant is fixed for all time, then everything today might have been pre-determined from the earliest moments of the physical universe.

The special theory of relativity, for example, describes a four-dimensional "block universe" in which all the possible events of the future already exist alongside those of the past. It makes "foreknowledge" of the future conceivable.

Diodorus Cronus dazzled his contemporaries in the fourth century BCE with sophisticated logical arguments, especially paradoxes, that "proved" there could be only one possible future.

Diodorus' Master Argument is a set of propositions designed to show that the actual is the only possible and that some true statements about the future imply that the future is already determined. This follows logically from his observation that if something in the future is not going to happen, it must have been that statements in the past that it would not happen must have been true.

Modern day "actualists" include Daniel Dennett, for whom determinism guarantees that the actual outcome is and always was the only possible outcome. The notion that we can change the future is absurd, says Dennett, change it from what to what?

The ancient philosophers debated the distinction between necessity and contingency (between the *a priori* and the

a posteriori). For them, necessity included events or concepts that are logically necessary and physically necessary, contingency those that are logically or physically possible. In the middle ages and the enlightenment, necessity was often contrasted with freedom. In modern times it is often contrasted with mere chance.

Causality is often confused with necessity, as if a causal chain requires a deterministic necessity. But we can imagine chains where the linked causes are statistical, and modern quantum physics tells us that all events are only statistically caused, even if for large macroscopic objects the statistical likelihood approaches certainty for all practical purposes. The apparent deterministic nature of physical laws is only an "adequate" determinism.

In modern philosophy, modal theorists like David Lewis discuss counterfactuals that might be true in other "possible worlds." Lewis' work at Princeton may have been inspired by the work of Princeton scientist Hugh Everett III. Everett's interpretation of quantum mechanics replaces the "collapse" of the wave function with a "splitting" of this world into multiple worlds.

According to the Schrödinger equation of motion, the time evolution of the wave function describes a "superposition" of possible quantum states. Standard quantum mechanics says that interaction of the quantum system with other objects causes the system to collapse into one of these possible states, with probability given by the square of the "probability amplitude."

One very important kind of interaction is a measurement by a "conscious observer."[5]

In standard quantum theory, when a measurement is made, the quantum system is "projected" or "collapsed" or "reduced" randomly into a single one of the system's allowed states. But if the system was "prepared" in one of these "eigenstates," then the measurement will find it in that state with probability one (that is, with certainty).

So modern physics does not deny the possibility of a *certain* measurement outcome, with probability equal to one, or even an *impossible* one, with probability equal to zero. But these are very special physical circumstances.

5 See chapter 18

Identity

In information philosophy, identity depends on the total information in an object or concept.

We distinguish the *intrinsic* information inside the object (or concept) from any relational information with respect to other objects that we call *extrinsic* or external. We can "pick out" the *intrinsic* information as that which is "self-identical" in an object. The Greeks called this the πρὸς ἑαυτο - self-relation. or ἰδίος ποιὸν, "peculiar qualifications" of the individual.

Self-identity, then, is the fact that the intrinsic information as well as the extrinsic relational or dispositional information are unique to this single object. No other object can have the same disposition relative to other objects. This is an absolute kind of identity. Some metaphysicians say that such identity is logically necessary. Some say self-identity is the only identity, but we can now support philosophers who argue for a *relative identity*.

To visualize our concept of information identity, imagine putting yourself in the position of an object. Look out at the world from its vantage point. No other object has that same view, that same relation with the objects around you, especially its relation with you. Now another object could have *intrinsic information identicality*. We will in fact identify a very large number of objects and concepts in the world that are intrinsically identical, including natural and artifactual kinds, which we may call digital kinds, since they are identical, bit for bit.

We can now offer three fundamental facts about identity:

Id1. Everything is identical to everything else in some respects.

Id2. Everything is different from everything else in some other respects.

Id3. Everything is identical to itself in all respects at each instant of time, but different in some respects from itself at any other time.

We can rewrite these observations in terms of information philosophy

I1. Any two things have some information in common.

I2. Any two things have some different information.

I3.The identity of anything over time is changing because the information in it (and about it) is changing with time.

These three observations might be called information axioms. Armed with them, we are in a position to "dis-solve" or deconstruct some of the most famous metaphysical puzzles and paradoxes.

A Criterion for Identity

After accepting the fundamental fact that nothing is perfectly identical to anything but itself, the criterion for *relative identity*, for identical "in some respect," or *qua* that respect, is that some subset of the information in two different things must be the same information, bit for bit.

Relative identity means that *a* can be the same *I* as *b*, but not the same *E* as *b*, where *I* is the sum of all the intrinsic properties and relations - internal self-relations between an object's different parts. For physical objects, these could be within some physical boundary, subject to conditions of vagueness. In a biological entity, it also includes the vast communications going on inside and between the cells, which makes it much more than a mereological sum of its parts.

The *E* for an object is the sum of extrinsic relations an object has with things outside, including its disposition in space and time.

Mathematically, $\int_i F(x) = \int_i G(x)$, but $\int_e F(x) \neq \int_e G(x)$, which says that F(x) and G(x) are identical over their intrinsic domains (i) but differ over their extrinsic domains (e) .

Set theoretically, in classical propositional calculus, we can say that I_a is the set of intrinsic properties and internal relations that

can be predicated in propositions about an object *a*. E_a is the set of extrinsic relations. We can now describe why absolute identity is limited to self-identity.

If $I_a + E_a = I_b + E_b$, then *a* and *b* are one and the same object.

And, if $I_a = I_b$, then *a* and *b* are *relatively* identical, *qua* their information content.

Note that while self-identity is reflexive, symmetric, and an equivalence self-relation, relative identity is often none of these. This is because, unlike Max Black's identical spheres, Saul Kripke's natural kinds, and our many digital clones, some part of the information in *a* and *b* may be identical, but the information that is not identical may also differ in quantity. We can say that if *aRb* is 60% identical, *bRa* may be only 10% identical.

Extensional quantification over things in analytic language philosophy is about their set membership, which is dependent on language references to the properties of objects.

By contrast, quantification in information philosophy is a calculation of the total information content in the entities, in principle, free of language ambiguities, in practice, very difficult.

A Criterion for Essence

Information identity suggests a possible definition of the "essence" of an object, what is "essential" about it. Furthermore, if two objects are considered "essentially" the same, we can pick out the subset of information that corresponds to that "essence."

A subset of the intrinsic information may be essential with respect to (*qua*) some concept of the object. As Edmund Husserl emphasized, our concepts about objects depend on our intentions, our intended uses of the object, which give it different (pragmatic) meanings. We can say that an essence is the subset of an object's information that is isomorphic to the information in the concept.

What we call a "concept" about a material object is usually some subset of the information in the object, accurate to the extent that

the concept is isomorphic to that subset. By "picking out" different subsets, we can sort objects. We can compare objects, finding them similar *qua* one concept and different *qua* another concept. We can say that "$a = b$" *qua* color but not *qua* size.

But there are concepts that may have little to do with the intrinsic peculiar information about an object. They are concepts imposed on the object by our *intended* uses of it.

We must distinguish these extrinsic essences – our external ideas and concepts about what the object is – from the intrinsic essences that depend only on the object itself and its own purposes, if any. The essences we see in an object are subjective, but we may define an objective essence as the total intrinsic information, including internal messaging, in the object.

Husserl and Gottlob Frege both pointed out that our ideas are dependent on our personal experience. Experience constrains and amplifies our possible concepts. Two persons may get the general "sense" or "meaning" of something referred to, but Frege said the "idea" or representation (*Vorstellung*) in each mind can be very different, based on that individual's experience. Information philosophy locates the creation of meaning in the responses of the experience recorder and reproducer (ERR) to different stimuli.

The relation "identical to," between two numerically distinct concrete or abstract entities, is the source of logical puzzles and language games through the ages that are little more than verbal disputes. Most such disputes are easily resolved or "dis-solved" by paying careful attention to all the information, all the particular properties, intrinsic and extrinsic, of the two entities that may be identical *qua* some particular properties.

Coinciding Objects

The problem of coinciding objects (sometimes called colocation) is whether two things can be in the same place at the same time. Common sense says that they cannot.

John Locke described the impossibility that two things of the same kind should exist in the same place at the same time.

> ANOTHER occasion the mind often takes of comparing, is the very being of things, when, considering anything as existing at any determined time and place, we compare it with itself existing at another time, and thereon form the ideas of wherein identity and diversity. When we see anything to be in any identity place in any instant of time, we are sure (be it what it will) that it is that very thing, and not another which at that same time exists in another place, how like and undistinguishable soever it may be in all other respects: and in this consists identity, when the ideas it is attributed to vary not at all from what they were that moment wherein we consider their former existence, and to which we compare the present. For we never finding, nor conceiving it possible, that two things of the same kind should exist in the same place at the same time, we rightly conclude, that, whatever exists anywhere at any time, excludes all of the same kind, and is there itself alone. [6]

In modern metaphysics, the problem of coinciding objects should be the question of whether one mass of material – what the Greeks called substrate or ὑποκείμενον ("the underlying") – could contain the whole of two (or more) separate objects containing that same mass.

It is now common for many identity theorists to claim that the whole of one object and the whole of another can occupy just the same place at just the same time. Among them, according to Michael Burke, are Roderick Chisholm, E. Jonathan Lowe, Saul Kripke, and David Wiggins.

But it is not clear that this was the ancient problem in debates between the Academic Skeptics and the Stoics. In modern times, multiple ancient puzzles are used to pose the problem of coinciding objects. One is the Statue and the Clay from which it is sculpted. Another is Dion and Theon, known as the "body-minus" problem. Another is Tibbles, the Cat and a similar cat missing his tail. A third is the Stoic Chrysippus's so-called "Growing Argument."

All these modern claims that there can be two "coinciding objects" can be shown to be distinguishing between different aspects, in particular, the matter and form, of a single object,

6 *Essay Concerning Human Understanding*, Of Identity and Diversity, Book II, ch xxvii

giving them different names, and then arguing that they have different *persistence* conditions.

Aristotle's Metaphysics makes perhaps the earliest and clearest such distinction, using the example of a statue and its matter.

> 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.
>
> 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.[7]

Aristotle clearly sees the statue as a combination of its form/shape and its matter/clay.

Of course Aristotle sees no problem with the body and soul of a person being combined in one substance (οὐσία), but a hundred or so years after Aristotle, 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. And this may have been the beginning of the modern problem.

The "two things" that bothered the Skeptics appeared first in the "growing argument" described by the later second century BCE Stoics, Posidonius and Mnesarchus, as reported by Stobaeus in the fifth century CE. What is it that grows, they asked, the material substance or the peculiar qualities of the individual? But note that this is still matter versus form. The substance (matter) does not grow. It is the individual that grows.

> The substance neither grows nor diminishes through addition or subtraction, but simply alters, just as in the case of numbers and measures. And it follows that it is in the case of peculiarly qualified indi-

7 *Metaphysics*, Book VII, § iii, 1-2

> viduals, such as Dion and Theon, that processes of both growth and diminution arise.
>
> Therefore each individual's quality actually remains from its generation to its destruction, in the case of destructible animals, plants and the like. In the case of peculiarly qualified individuals they say that there are two receptive parts, the one pertaining to the presence of the substance, the other to that of the qualified individual...
>
> The peculiarly qualified thing is not the same as its constituent substance. Nor on the other hand is it different from it, but is all but the same, in that the substance both is a part of it and occupies the same place as it, whereas whatever is called different from something must be separated from it and not be thought of as even part of it...[8]

Like Aristotle, the Stoics were distinguishing the individual's "constituent substance" from the "peculiar qualifications" of the individual.

The Stoic term for "constituent substance" or substrate, following Aristotle, was ὑποκείμενον. Their term for the unique person, possibly separate from the material body, was ἰδίος ποιὸν - a particular individual "who," for example, Socrates, as opposed to κοινός ποιὸν, a general "whoness," for example, a human being.

But in the vehement debates of the third century BCE the Academic skeptics laughed at the Stoics for seeing a dual nature in man. Their most famous puzzle was the coinciding objects of Dion and Theon (reframed by Peter Geach as the puzzle of Tibbles, the Cat and a similar cat lacking a tail).

Plutarch, writing in the first century CE, accused the Stoics of "crazy arithmetic" and absurdity, that "each of us is a pair of twins, two-natured and double, joined in some parts but separate in others, two bodies sharing the same color, the same shape, the same weight, the same place,"

> Yet this difference and distinction in us no one has marked off or discriminated, nor have we perceived that we are born double, always in flux with one part of ourselves, while remaining the same people from birth to death with the other...

8 Stobaeus (I,177,21 - 179,17, in *The Hellenistic Philosophers*, A.A.Long and D.N.Sedley, v.1, p.168

> If when we hear Pentheus in the tragedy say that he sees two suns and a double Thebes we say he is not seeing but mis-seeing, going crazy in his arithmetic, then when these people propose that, not one city, but all men, animals, trees, furniture, implements and clothes are double and two-natured, shall we not reject them as forcing us to misthink rather than to think?[9]

Another early statement is in the first century BCE.

> That what concerns the peculiarly qualified is not the same as what concerns the substance, Mnesarchus says is clear. For things which are the same should have the same properties. For if, for the sake of argument, someone were to mould a horse, squash it, then make a dog, it would be reasonable for us on seeing this to say that this previously did not exist but now does exist. So what is said when it comes to the qualified thing is different.
>
> So too in general when it comes to substance, to hold that we are the same as our substances seems unconvincing. For it often comes about that the substance exists before something's generation, before Socrates' generation, say, when Socrates does not yet exist, and that after Socrates' destruction the substance remains although he no longer exists.[10]

An Information Analysis of "Coinciding Objects"

Most of these metaphysical puzzles start with a single object, then separate it into its matter and its form, giving each of them names and declaring them to be two coinciding objects. Next we postulate a change in either the matter or the form, or both. It is of course impossible to make a change in one without the other changing, since we in fact have only one object.

But our puzzle maker asks us to focus on one and insist that the change has affected the status of only that one, usually claiming that the change has caused that one to cease to exist. This follows an ancient view that any change in material constitutes a change in identity. But the modern metaphysicist knows that all objects are always changing and that a change in identity may always preserve some information of an entity. The puzzle claims that an

9 "Against the Stoics on Common Conceptions" 1083, *The Hellenistic Philosophers*, A.A.Long and D.N.Sedley, v.1, p.166-7

10 *ibid*, p.168

aspect of the object persists if the relative identity, or identity "in some respect" has not changed.

To create a paradox, we use two of our axioms about identity,

Id1. Everything is identical to everything else in some respects.

Id2. Everything is different from everything else in some other respects.

We (in our minds) "pick out" one respect whose identity persists over time because of Id1 and a second respect which changes in time because of Id2.

We now have one object that both persists and does not persist (in different respects, of course), the very essence of a paradox. We call them different objects to create the puzzle.

For example, in the case of the statue and the clay, Mnesarchus's original version assumed that someone moulds a horse, then squashes it. We are asked to pick out the horse's shape or form. The act of squashing changes that shape into another relatively amorphous shape. The object changes its identity with respect to its shape. Mnesarchus said it would be reasonable to see this sequence of events as something coming into existence and then ceasing to exist. The most obvious thing changing is the horse shape that we name "statue."

By design of the puzzle, there is no change in the amount of clay, so the matter is considered identical over time with respect to the amount of clay. The clay persists.

We now claim to have seen a difference in persistence conditions. The object *qua* clay persists. The object *qua* statue goes in and out of existence.

But this is just a *way of talking* about what has happened because a human observer has "picked out" two different aspects of the one object. As the statue is being smashed beyond recognition, every part of the clay must move to a new position that accommodates the change in shape of the statue. There are changes in

the clay with identical information to the change in the shape of the statue. These we ignore to set up the puzzle.

In more modern versions of the statue and clay puzzle, we can make a change in the matter, for example by breaking off an arm and replacing it with a new arm made of different material but restoring the shape. We ignore the change in form, although it was obviously a drastic change until the restoration, and we focus on the clay, making the claim that the original clay has ceased to exist and new clay come into existence.

In either case, the claim to see different persistence conditions is the result of focusing on different subsets of the total information.

When identity theorists say that the whole of one object and the whole of another can occupy just the same place at just the same time, they are never talking about two objects of the same type, kind, or sort. They are always "picking out" different aspects of a single object and giving them differing existential status.

Composition (Parts and Wholes)

Debates about the relation of parts to wholes is a major part of modern metaphysics. Many puzzles have to do with different persistence conditions of the "parts" of a composited whole, as we saw with the idea of coinciding objects.

"Mereological universalism" or extensional mereology is an abstract idea, defined in 1937 by Stanislaw Leśniewski and later by Henry Leonard and Nelson Goodman (1940). It claims that any collection of things, for example the members of a set in symbolic logic, can be considered as the parts of a whole, a "fusion" or "mereological sum," and thus can *compose* an object. Critics of this idea says that such arbitrary collections are just "scattered objects." A mind-independent connection between things is needed for them to be considered *integral* "parts."

That connection is to be found in the *information* that led to the whole in the first place and/or is now maintaining that integrity.

"Mereological essentialism" is Roderick Chisholm's radical idea that every whole has its parts necessarily and in every possible world. This goes too far. No physical object can maintain its parts indefinitely and freeze its identity over time. Recall our third axiom of identity:

Id3. Everything is identical to itself in all respects at each instant of time, but different in some respects from itself at any other time.

"Mereological nihilism" is the opposite extreme. Peter van Inwagen and the early Peter Unger denied the existence of composites, seeing them as simples (partless entities) arranged to look like a composite object. For van Inwagen, a table is "simples arranged table-wise."

It is the *information* in the process that is doing the arranging is responsible for the composite whole.

Van Inwagen made a surprising exception for living objects. He bases the composite nature of biological entities on the Cartesian dualist view that humans are thinking beings!

Van Inwagen's says that his argument for living beings as composite objects is based on the Cartesian "Cogito," I think, therefore I am.

> My "reasons for believing in organisms," therefore, are reasons for stopping where I do and not going on to maintain that there are no organisms but are only simples arranged organically. My argument for the existence of organisms, it will be remembered, involved in an essential way the proposition that I exist.[11]

With van Inwagen's exception of living things, and now that Unger has abandoned his own form of nihilism in recent years, both philosophers now accept that they themselves exist (*sic*).

Van Inwagen could see no obvious demarcation level at which even the simplest living things should not be treated as composite objects. We shall see that it is *biological information* that makes a whole being out of just matter and energy.

Information philosophy and metaphysics ask who or what is doing the arranging? Information provides a more fundamental

11 *Material Beings*, p.213

reason than van Inwagen's for treating living things as integrated composites and not simply mereological sums of scattered objects. Furthermore, it extends a true composite nature to artifacts and to groupings of living things because they share a *teleonomic* property – a purpose. And it shows how some "proper parts" of these composites can have a holistic relation with their own parts, enforcing transitivity of part/whole relations.

A process that makes a composite object an integrated whole we call *teleonomic* (following Colin Pittendrigh, Jacques Monod, and Ernst Mayr) to distinguish it from a teleological cause with a "telos" pre-existing all life. Teleonomy is the explanatory force behind van Inwagen's "arrangement" of simple parts.

Biological parts, which we can call *biomers*, are communicating systems that share information via biological messaging with other parts of their wholes, and in many cases communicate with other living and non-living parts of their environments. These communications function to maintain the biological integrity (or identity) of the organism and they control its growth. Artifacts have their teleonomy imposed by their creators. For example, when a carpenter cuts the wood for a table, it is the "telos," the end or purpose for the table, that "arranges it table-wise."

Biocommunications are messages transferring information, inside the simplest single-cell organisms. For the first few billion years of life these were the only living things, and they still dominate our planet. Their messages are the direct ancestors of messages between cells in multicellular organisms. They evolved to become all human communications, including the puzzles and problems of metaphysics. A straight line of evolution goes from the first biological message to this book of *Great Problems*.

Like many metaphysical problems, composition arose in the quarrels between Stoics and Academic skeptics that generated several ancient puzzles still debated today. But it has roots in Aristotle's definition of the essence (ουσία), the unchanging "Being" of an object. We will show that Aristotle's essentialism has a biological basis that is best understood today as a biomereological

essentialism. It goes beyond mereological sums of scattered objects because of the teleonomy shared between the parts, whether living or dead, of a biomeric whole.

The *essence* of an object, the "kind" or "sort" of object that it "is", its "constitution," its "identity," includes those "proper" parts of the object without which it would cease to be that sort or kind. Without a single essential part, it loses its absolute identity.

While this is strictly "true," for all practical purposes most objects retain the overwhelming fraction of the information that describes them from moment to moment, so that information philosophy offers a new and quantitative measure of "sameness" to traditional philosophy, a measure that is difficult or impossible to describe in ordinary language.

Nevertheless, since even the smallest change in time does make an entity at $t + \Delta t$ different from what it was at t, this has given rise to the idea of "temporal parts."

Temporal Parts

Philosophers and theologians, e.g., Alfred North Whitehead and Jonathan Edwards, have argued for distinct temporal parts, with the idea that each new part is a completely new creation *ex nihilo*. The world is newly created at every instant! Even modern physicists (e.g., Hugh Everett III) talk as if parallel universes are brought into existence at an instant by quantum experiments that collapse the wave function.

David Lewis, who claims there are many possible worlds, is a proponent of many temporal parts. His theory of "perdurance" asserts that the persistence through time of an object is as a series of completely distinct entities, one for every instant of time. Lewis's work implies that the entire infinite number of his possible worlds (as "real" and actual as our world, he claims), must also be entirely created anew at every instant.

While this makes for great science fiction and helps to popularize metaphysics, at some point attempts to understand the

fundamental nature of reality must employ Occam's Razor and recognize the fundamental conservation laws of physics. If a new temporal part is created *ab initio*, why should it bear any resemblance at all to its earlier version?

It is extravagant in the extreme to suggest that all matter disappears and reappears at every instant of time. It is astonishing enough that matter can spontaneously be converted into energy and back again at a later time.

Most simple things (the elementary particles, the atoms and molecules of ordinary matter, etc.) are in stable states that exist continuously for long periods of time, and these compose larger objects that persist through "endurance," as Lewis describes the alternative to his "perdurance." Large objects are not absolutely identical to themselves at earlier instants of time, but the differences are infinitesimal in terms of information content.

The doctrine of temporal parts ignores the physical connections between all the "simples" at one instant and at the following moment. It is as if this is an enormous version of the Zeno paradox of the arrow. The arrow cannot possibly be moving when examined at an instant. The basic laws of physics describe the continuous motions of every particle. They generally show very slow changes in configuration – the organizational arrangement of the particles that constitutes abstract information about an object.

One might charitably interpret Lewis as admitting the endurance of the elementary particles (or whatever partless simples he might accept) and that perdurance is only describing the constant change in configuration, the arrangement of the simples, the *information*, that *constitute* or *compose* the whole.

Then Lewis's temporal parts would be a series of self-identical objects that are not absolutely identical to their predecessors and successors, just a temporal series of highly theoretical abstract ideas, perhaps at the same level of (absurd) abstraction as his possible worlds?.

Is a temporal part a reasonable concept? What exactly is a part? And what constitutes a whole? For each concept, there is a strict philosophical sense, an ordinary sense, and a functional or *teleonomic* sense.

In the strict sense, a part is just some subset of the whole. The whole itself is sometimes called an "improper part."

In the ordinary sense, a part is distinguishable, in principle separable, from other neighboring parts of some whole. The smallest possible parts are those that have no smaller parts. In physics, these are the atoms, or today the elementary particles, of matter.

In the functional sense, we can say that a part serves some purpose in the whole. This means that it has may be considered a whole in its own right, subordinate to any purpose of the whole entity. Teleonomic examples are the pedals or wheel of a bicycle, the organs of an animal body, or the organelles in a cell.

The *teleonomic* sense of an object is that it seems to have a *purpose*, the Greeks called it a *telos*, either intrinsic as in all living things, or extrinsic as in all artifacts, where the purpose was invented by the object's creator.

The most important example of a teleonomic process is of course biology. Every biological organism starts with a first cell that contains all the information needed to accomplish its "purpose," to grow into a fully developed individual, and, for some, to procreate others of its kind.

By contrast, when a philosopher picks out an arbitrary part of something, declaring it to be a whole something for philosophical purposes, perhaps naming it, the purpose is simply the philosopher's intention of analyzing it further.

For example, something that has no natural or artifactual basis, that does not "carve nature at the joints," as Plato described it, that arbitrarily and violently divides the otherwise indivisible, may be a perfectly valid philosophical "idea," an abstract entity.

But temporal parts do not "carve nature at the joints." They do not capture the fundamental nature of reality.

Temporal parts are bad metaphysics.

Aristotelian Essentialism

Aristotle knew that most living things can survive the loss of various parts (limbs, for example), but not others (the head). By analogy, he thought that other objects (and even concepts) could have parts (or properties) that are essential to its definition and other properties or qualities that are merely accidental.

Aristotelian essentialism is the study of those essential parts.

For Aristotle, and in ordinary use, not every part of a whole is a *necessary* part (let alone in all possible worlds). Much of the verbal quibbling in metaphysical disputes is about objects that are defined by language conventions as opposed to "natural kinds" that we can recognize by their information contents.

When we can identify the origin and current processing of that information, we have the deep metaphysical sense of essence. Aristotle called the arrangement "the scheme of the ideas."

> 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)[12]

Information philosophy provides the deep reason behind Aristotle's essentialism for living things and artifacts.

The "parts" of biological organisms are created and maintained (arranged) by anti-entropic processes that distribute matter and energy to all the vital parts. There is a purpose or "telos." Aristotle called it a built-in telos or "entelechy" (loosely translated as "having the final cause within"). The telos is implemented by messaging between all the vital parts or "proper parts." A biomereological essentialism notes that every biomer (a biological part) is normally in direct or indirect communication with vast numbers of other biomers in the living organism and with the extra-cellular environment. Communication is information that

12 *Metaphysics*, Book VII, § vii

is neither matter nor energy. It is the ideal content of the message that implements the organism's "telos." Some examples...

• Human artifacts. Here the "telos" comes from the creator. The leg of a table is an essential part of the original design. Such proper parts often have recognizable functions, so when they are missing the whole is no longer functional.

• Physical combinations of elementary particles into nuclei and chemically emergent combinations of atoms – water from hydrogen and oxygen and salt from sodium and chlorine.

• Cosmological and other material objects formed with an anti-entropic process that created their information. Astronomical bodies were pulled together by gravity into information structures. Crystals grow information rich structures (e.g., snowflakes).

Many of these "wholes" can survive the loss of some parts. But we are back quibbling. When their efficient/material causes and their formal and final causes are "teleonomic" and not simply arbitrary human conventions, we can say these are "natural kinds."

The problem of composition becomes more severe when some metaphysicians consider matter to be infinitely divisible, just as the real number line contains an infinite number of numbers between any two numbers (and a higher order of infinity of irrational numbers!).

By contrast, the metaphysicist's view is that matter is discrete, not infinitely divisible like the continuous spatial and temporal dimensions. The Greek materialists argued for simple atoms separated by a void. Ludwig Boltzmann and Albert Einstein showed that the atoms of nineteenth-century chemistry really exist. In modern physics the simplest elementary particles are quarks, leptons, and bosons. So let's suppose that we have a region of space with two oxygen atoms in it. It seems reasonable to say that it contains two simple things (the atoms).

Peter van Inwagen denies the mereological sum. David Lewis defends it. Recent mereological debates in metaphysics have taken this form:

Mereological nihilist: There are two things in this region.

Mereological universalist: There are three things in this region (the two simples and the mereological sum).

Now a metaphysicist can still argue cleverly and cogently about the proper number of parts and the choice of the proper whole. The oxygen atoms each contain eight protons, eight neutrons, and eight electrons. So one possible count is the 48 sub-atomic particles that are visible. We can go deeper by noting that the nuclear particles are each made up of three quarks, which are not observable. We then can count 112 parts to the whole?

And the metaphysicist has a strong argument for the two simple atoms to be considered a whole. If the two atoms are very close, they can form an oxygen *molecule*. Even when disassociated, quantum mechanics that treats them as a quasi-molecule is more accurate than a description as two independent atoms.

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 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 whole of natural science (or the whole corpus of the natural sciences)*"[13]

Information philosophy has shown that the meaning of words depends on the experiences recalled in minds by the experience recorder and reproducer (ERR).[14] Since every human being has a different set of experiences, there will always be variations in meaning about words between different persons.

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 Ludwig Wittgenstein may have seen as a model and "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, some day visible on the Internet. While computer models are only "simulations" of reality, they incorporate the best "laws" of physics, chemistry, and biology.

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 extraordinary biological machines that

13 *Tractatus Logico-Philosophicus*, 4.11

14 See Appendix E.

have evolved to keep us alive and let us think can be "shown," not said, just as Wittgenstein imagined.

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 "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 the equally deterministic "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 another variation of the great duals of idealism and materialism.[15] See **possibilist.com**.

History of Metaphysics

Metaphysics has signified many things in the history of philosophy, but it has not strayed far from a literal reading of "beyond

15 See the table of dualisms in chapter 9.

the physical." The term was invented by the first-century BCE head of Aristotle's Peripatetic school, Andronicus of Rhodes, who 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.

Aristotle never used the term metaphysics. For Plato, Aristotle's master, the realm of abstract ideas was more "real" than that of physical objects, because ideas could be more permanent (the Being of Parmenides), whereas material objects are constantly changing (the Becoming of Heraclitus). Neoplatonists like Porphyry worried about the existential status of the Platonic ideas. Does Being exist? What does it mean to say "Being Is"?

Aristotle's original concerns in his "First Philosophy" were ontology (the science of being), cosmology (the fundamental processes and original causes of physical things), and theology (is a god required as a "first mover" or "first cause?").

Aristotle's Physics describes 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.

Metaphysics is the division of philosophy which includes ontology, or the science of being, and cosmology, or the science of the fundamental causes and processes of things. The primary meaning of metaphysics is derived from those discussions by Aristotle which later commentators suggested should be read before Aristotle's great works on Physics and other subjects.

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 cognition of God. Aquinas argued that 1) God had given man the power of reason, 2) God had used reason to create the universe, so that 3) man can use reason alone to understand the world.

John Duns Scotus disagreed with Aquinas, arguing that God's omnipotence is not constrained by reason. God has freedom of the will, so only study of the world as it has been created can yield knowledge of the world and thus God. Scotus was arguably the origin of British empiricism, just as Aquinas was the source of Continental rationalism.

René Descartes began 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. For empiricists in England like John Locke and David Hume, metaphysics includes the "primary" things beyond psychology and "secondary" sensory experiences. They denied that any knowledge was possible apart from experimental and mathematical reasoning. Hume thought metaphysics 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.[16]

16 (Enquiry Concerning Human Understanding, section XII)

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

The notion that metaphysics transcends experience and the material world led to nineteenth-century positivists like August Comte and Ernst Mach, and twentieth-century empiricists like Rudolf Carnap and Moritz Schlick, also denying the possibility of metaphysical knowledge.

Naturalism is the anti-metaphysical claim that there is nothing in the world beyond the material (including energy), that everything follows "laws of nature," and that these laws are both causal and deterministic. So "supernatural" appears to imply the freedom to break the laws of nature. Information philosophy denies the supernatural. But it defends *immaterial* information as that which constitutes the human spirit, or soul, the "ghost in the machine." And it defends ontological chance as the generator of novel possibilities that are not determined by the "fixed past."

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. Comtean positivism rejected metaphysics and theology as obsolete earlier phases in the development of knowledge.

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

The logical positivism of Bertrand Russell and Ludwig Wittgenstein claims that all valid knowledge is 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. Logical positivists and the logical empiricists of the Vienna Circle asserted that all knowledge is scientific knowledge, that it is derived from experience, i.e., from verifiable observations. They added the logical analysis of language as a tool for solving philosophical problems. They divided statements into those reducible to simpler statements about experience and those with no empirical basis, which they called "metaphysical" and "meaningless."

Most analytic language philosophers of the mid-twentieth century continued to deny traditional metaphysics, which P. F. Strawson famously called "obscure and panicky." But starting in the 1970's a new group of analytic-language metaphysicians defended a new materialist and determinist metaphysics grounded in modal thinking about possible worlds.

See **metaphysicist.com** for discussions of the work of David Armstrong, Michael Burke, David Chalmers, Rod Chisholm, Peter Geach, David Lewis, E. Jonathan Lowe, Trenton Merricks, Huw Price, Willard van Orman Quine, Michael Rea, Nicholas Rescher, Alan Sidelle, Ted Sider, Richard Taylor, Peter Unger, Peter van Inwagen, David Wiggins, and Timothy Williamson.