

PARTS

The Philosophical Assumptions of Darwin's Argument

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Section I:

Darwin's Argument

In the last chapter of The Origin of Species, Charles Darwin acknowledges that "... this whole volume is one long argument...". Buried in an avalanche of evidence with paragraph-long, multiple subject sentences, it's hard to keep track of his maze of claims and counterclaims about the very ancient past. However, Darwin himself never lost focus on the premises and radical conclusions of his argument, nor the premises and radical conclusions of his opponents. Throughout this great book, and his other books on evolution, he returns over and over again, to a short, clear, and fundamental argument:

Darwin's Argument (DA)

1. The theory of evolution (T/E) explains facts
2. The theory of creation (T/C) does not explain facts
3. Therefore, the theory of evolution is true, and
4. Therefore, the theory of creation is false.

Over 150 years have passed since the publication of the Origin. Vast quantities of ink and blood have been spilled, tempers flared, data collected, and advances in technology made, since Darwin presented his argument. His "Theory of Descent with Modification by means of Variation and Natural Selection" has become the "theory of evolution." Generations of scholars, scientists,

preachers, farmers, nurses, and plumbers have heard about T/E in Sunday sermons and high school biology classes, then went on their paths through life as if it were vaguely meaningful for monkeys and bacteria, but not relevant for their everyday lives.

We were not taught the whole of Darwin's Argument. Even though Darwin demonstrated the truth of T/E beyond a reasonable doubt, we were not encouraged to examine T/E's extreme implications, nor its strange, unfathomable, and rigid story of our past. We were not taught that Darwin also devastated and falsified T/C, pushing it so far back in time that it disappeared from science, and from the science classes in public schools. Yet, oddly, T/C is by far the prevailing set of beliefs held by peoples and cultures around the world. Regardless of the level of formal education, the vast majority of people around the world hold that T/C is true, and that T/E is false. What happened? After all this time and information, why is Darwin's Argument still unknown and hidden away?

The purpose of this essay is to unravel, examine, and evaluate Darwin's Argument. In order to understand the short, simple premises and conclusions of DA, we need to address and clarify these enormously complex questions:

What is a fact?

What is a theory?

What is explanation?

For ages, human beings have reflected upon these questions. Philosophers, theologians and scientists have filled volumes with multiple and incompatible views. To start with, each answer to each question is based upon certain philosophical assumptions that will affect which answers make sense. Darwin made assumptions which greatly affect the meaning and success of his argument. Part of my review of DA is the attempt to identify these assumptions.

The term "assumption" is itself complex and controversial. I use the term to refer to a framework of background conceptual tools by which an individual person (and perhaps any sentient organism) experiences, responds to, and thinks about the world. When that individual uses written or spoken language to describe or express that experience to another individual, the entire process of communication has a formal structure of understanding and rationality. To participate in this process of using language to communicate with another person requires a recognition and acceptance of that

formal structure. Philosophical assumptions are part of what constitutes this formal structure of communication of experience and thought.

Assumptions make communication possible, and each participant in the process has a perspective and set of assumptions upon which communication is grounded. In order for communication to occur, the participants must share at least some assumptions. When individuals share assumptions and agree with each other's claims about the world, there is little need to examine these grounds. However, when dispute makes claims incompatible, an analysis may be necessary to expose the points of dissent, whether matters of fact, or matters of background assumptions.

Darwin read and referred to Kant, Hume, Mill, Locke and other philosophers of his day. He was passionate about, and had deep insights into, philosophical issues concerning the existence of god, the mind/body problem, causation, freedom of the will, moral responsibility, personal identity, universals and particulars, aesthetics, the development of language, and more, yet he stated many times that he was not a philosopher. He did experiments, collected data and wrote books about barnacles, earthworms, orchids, climbing plants, and human beings, but he did not write any books specifically addressing issues of philosophy. Consequently, we don't know his exact position on these formative issues. Yet he is one of the most, if not the most, influential and controversial thinkers that has ever lived, and his philosophical assumptions greatly affected his theorization. In order to understand and judge the truth and validity of DA, it is essential to correctly assess the controversy, and parse out these assumptions.

Darwin's Assumptions

1. Correspondence theory of truth

A. Truth consists of a relationship of correspondence between sense experience, language, and thought, with reality.

B. Criterion of truth: for any proposition "P", "P" is true if and only if P.

2. Realist theory of knowledge

A. Knowledge is justified true belief.

B. Facts, and relations between facts, are knowable.

3. Realist theory of mathematics and logic

A. Certain laws of mathematics and propositional logic are true of the real world, and correspond to the structure of reality.

a. Law of identity:

For any proposition "P", if P, then P. In relation to reality, this law asserts that "X is X" and "X is itself."

a

b. Law of the excluded middle:

For any proposition "P"; P is either true or false. Or, for any proposition "P", either P or not-P. In relation to reality, this law asserts "Any X is either X, or not-X."

c. Law of non-contradiction:

For any proposition "P", if P, then not-(P and not-P). In relation to reality, this law asserts "No X is both X, and not-X."

4. Realist theory of causation

A. Reality has a structural framework of general causal laws of which facts/events are instances.

B. Causation is a mind independent relation of necessity between facts/events that are instances of general principles that are true.

C. General causal laws, and specific causal relations, are knowable.

5. Realist principle of identity

A. X exists if and only if X is identifiable and re-identifiable in time and space.

6. Realist principle of evidence

A. Evidence is a fact which identifies a causal relation between separate and independent facts.

B. Observations, tests, and predictions provide evidence for causal relations.

As I formulate and assess DA, I will try to show that these are, in fact, Darwin's philosophical assumptions. I will also try to show that most of the disputes over the truth and validity of DA require review and judgment on these assumptions. I will argue that, if given the same assumptions, then T/E and T/C are incompatible; that T/E is true; that T/C is false; and that when T/E and T/C disagree, T/C has the burden of identifying and justifying its own assumptions.

I will argue that the success of T/E in all the branches of science is strong evidence that Darwin's underlying philosophical assumptions are correct, and true of reality.

I will also argue that T/E implies extreme materialism, that T/C implies extreme dualism, and I will briefly assess the affects of these implications upon several fundamental issues of philosophy - the mind/body problem, personal identity, life after death, freedom of the will, and the existence of god. While it seems to me that the truth of T/E has profound implications on these issues, I also try to come to terms with the fact that truth and evidence are often a minor, or irrelevant, factor affecting most persons' beliefs about what kinds of things exist, the meaning of their own lives, and their place in the world. Life is complicated and fragile, and we hold deep convictions for reasons other than truth and evidence.

What is a fact?

“I am a complete millionaire in odd and curious little facts.”

(Autobiography of Charles Darwin, p. 281)

“It is an important fact that rudimentary organs, such as teeth in the upper jaws of whales and ruminants, can often be detected in the embryo, but afterwards wholly disappear.”

(Origin, p. 476, 1st)

“Until I tried a few experiments, it was not even known how far seeds would resist the injurious action of sea water. To my surprise, I found that out of 87 kinds, 64 germinated after an immersion of 28 days, and a few survived an immersion of 137 days.”

(Origin, p. 355, 1st)

Assumption 1: Truth

When observing, collecting data, and making statements, Darwin assumes and is committed to a traditional correspondence theory of truth. A correspondence theory examines the relationship between perception, language, thought and reality. In describing this relation, we make assumptions concerning the veracity of sense perception, the ontological status of universals and particulars, the conditions of ascribing properties to objects, and the use of language and logic to communicate these

ascriptions. Each of these issues of analyzing truth adds a layer of complexity to the question: what is a fact?

A correspondence theory claims that truth consists of a “correspondence” between thought and reality. First, a thought takes the form of a sentence, assertion, belief, or proposition (“There are four beers in the refrigerator”), and second, reality is a collection of objects (bottles, refrigerators, molecules) and relations between objects (location, size, density). A correspondence theory of truth tries to identify what it is that makes a thought correspond to reality. What are the conditions that make the statement “There are four beers in the refrigerator.” true or false?

One way to formulate a correspondence theory, which I think is accurate for understanding Darwin, is to discuss truth in terms of “states of affairs,” and by making claims that states of affairs do exist or that states of affairs do not exist.

A “state of affairs” is a set of objects and their relations at a particular location in time and space. To use an analogy, a state of affairs is like a snapshot of the world at a particular time that captures and distinguishes any object, and its relation to any other object. One function of language, the function we are most concerned with in this discussion of DA, is to refer to and describe objects and their relations. For example, one can formulate sentences which refer to and describe any number of objects: “The rattlesnake under the rock is angry.”; “The empire state building is made of marshmallows.”; “As you climb the hill, your body needs more oxygen.”; “The star Zantos exploded two million light years ago.”

Each of these statements refers to and describes, objects and the relations between objects, and these objects and relations are “states of affairs.”

In formulating a correspondence theory, an important metaphysical assumption of using the term “states of affairs” is that states of affairs may be said to exist or not exist. Most beliefs, propositions and statements in our everyday lives are assertions that a specific state of affairs exists or does not exist. In order to understand what Darwin considers a “fact,” it is important to accept that a “state of affairs” may be identified as that part of reality to which a statement refers.

A correspondence theory establishes certain conditions of truth: A statement (belief, assertion, claim, proposition) is true if and only if, first, it is a statement with respect to a certain state of affairs that that state of affairs exists, and, secondly, that that state of affairs does exist. Also, a statement is true if and only if it is a statement with respect to a certain state of affairs that that state of affairs does not exist, and that that state of affairs does not exist.

A statement is false if and only if, first, it is a statement with respect to a certain state of affairs that that state of affairs does exist and, secondly, that that state of affairs does not exist. Also, a statement is false if and only if it is a statement with respect to a certain state of affairs that that state of affairs does not exist, and that that state of affairs does exist.

A “truth” is a statement that is true. Truths refer to facts and a “fact” is a state of affairs that exists. (Adapted from Theory of Knowledge, particularly chapter 7, by Rodrick M. Chisholm, 1966 Prentice Hall)

Darwin assumes a similar correspondence theory of truth. In relation to this assumption, a fact is a state of affairs that exists. The statement “There is a starfish in the tide pool.” refers to the state of affairs of a starfish located in a tide pool. This statement is true if and only if that state of affairs referred to in the statement exists. If the statement “There is a starfish in the tide pool” is true, then it is a fact that there is a starfish in the tide pool.

A correspondence theory of truth establishes the criteria, or conditions, that must be satisfied in the relation between thought, language and reality:

A thought is a statement in propositional form that a certain state of affairs exists. A true thought is a true statement. A true statement corresponds to a fact by referring to a fact. A fact is a state of affairs that exists. Hence, a true thought is an assertion that corresponds to the facts of reality.

This may seem like a needless and trivial discussion of what everyone considers ordinary common sense and common usage of the terms “true” and “false.” However, the fact that Darwin assumes a correspondence theory is crucial for understanding his argument. According to Darwin, both T/E and T/C attempt to explain the very same facts. His correspondence theory will provide the criteria for evaluating the claims made by both T/E and T/C about what is a fact and what is the cause of a fact. In order for T/E and T/C to explain the same facts, they must assume the same correspondence theory of truth.

Assumption 2: Knowledge

Darwin assumes a realist theory of knowledge in which knowledge is justified true belief and facts are knowable. This theory commits him to the truthfulness of sense perception and the truthfulness of ascribing properties to objects. When he observed bones and recognized that the skeletal structure of the flipper of a seal resembles the skeletal structure of the hand of a human,

Darwin assumes: that bones exist; that some bones are from a seal and some from a human; and that one set of bones is similar in structure to another set of bones. His implicit theory claims that through certain sources of knowledge, we know these objects exist, we know their properties and we know their relations with other objects.

A traditional western realist theory of knowledge claims that there are four sources of knowledge:

- Sense perception (“I see a red tomato on the table”)
- Memory (“Yesterday, that tomato was green”)
- Self-awareness (“I’m thirsty”)
- Reason (“If Rainy Day is a dog, then Rainy Day is a mammal”)

(Theory of Knowledge, by Rodrick Chisholm, p. 57)

The fact that sense perception, memory and self-reporting of experience are sometimes wrong or false, and the fact that the truths of formal logic have no content and yield no truth about the world, have led philosophers to question the reliability and veracity of each source of knowledge. However, Darwin accepted and did not question those sources. He assumed that his perceptions, memories, feelings and formal reasoning produced knowledge of facts, and his claim that T/E explained facts is based on this assumption.

Although in the Origin Darwin did not analyze the veracity of observation, in another of his books on T/E, The Expression of Emotions in Man and Animals, he develops a profound and detailed theory of perception and consciousness which also delineates his concept of knowledge. Some of the terminology is dated (e.g. “nerve force,” “antithesis,” “will”) but the data and basic principles still provide a strong argument concerning the relations between nerves, brains, sensation, emotion, thought, language and reality.

“No doubt as long as man and all other animals are viewed as independent creations, an effectual stop is put to our natural desire to investigate as far as possible the causes of Expression. By this doctrine [i.e. T/C], anything and everything can be equally well explained; and it has been proven pernicious with respect to Expression as to every other branch of natural history. With mankind some expressions, such as the bristling of the hair under the influence of extreme terror, or the uncovering of the teeth under that of furious rage,

can hardly be understood except on the belief that man once existed in a much lower and animal-like condition. The community of certain expressions in distinct though allied species, as in the movements of the same facial muscles during laughter by man and by various monkeys, is rendered somewhat more intelligible, if we believe in their descent from a common progenitor. He who admits on general grounds that the structure and habits of all animals have been gradually evolved, will look at the whole subject of Expression in a new and interesting light.”

(Expression, p. 23)

Darwin's theory of perception proposes three principles which describe and govern the structure of sense experience and the communication of experience between organisms. Sense experience is the physical, stimulus/response contact between parts of an organism (nerves, brains, chemicals, electrical impulses) and its conditions of life. His strategy is to show that the ontological status of emotions, and the expression of emotions, are explained by the principles of T/E. In the larger picture, those principles of perception become the grounds for Darwin's extreme materialism in which emotions, and expression of emotions, are numerically identical to body parts. These principles of perception imply that emotions, and the expression of emotions, are literally a complex structure of cells in a stimulus/response causal relation; and that this complex neural structure of consciousness is passed from parent to offspring according to T/E. Knowledge of the objects and laws of reality is made possible by the interaction of complex organisms in the causal chain of events which constitute their conditions of life. As organisms interact with their conditions of life and succeed in surviving and reproducing, their body parts of consciousness are passed on to their offspring. According to Darwin, perception and consciousness are heritable.

1. Principle of habit and instinct

According to T/E two of the primary distinctions between an organism (your dog) and a non-organism (your computer) are, first, an individual's relation of generation with its parent - every organism is the offspring of a parent, and second, that individual's participation in the causal chain - every organism is distinct from its conditions of life. Part of the difference between a living thing and a non-living thing consists of a stimulus/response causal relation between the nerve cells in an

organism, and the other objects in that organism's environment. This relation becomes evident by observing single cell organisms through a microscope. When amoeba or bacteria touch other individuals, or are stimulated by light waves or electrical charges, they respond by recoil, attraction or agitation. These two relations in time and space between a single cell organism and its parent, and between that offspring and its environment, are the structure of reality that ground T/E. From the most simple to the most complex, every organism is the offspring of a parent, and each interacts as both cause and effect with its environment.

All creatures are born with body parts and ways that these parts function within certain conditions of life. In order to access food, shelter and reproduction, creatures participate in their environment and behave in certain ways. In this first principle of perception, Darwin was particularly interested in the consciousness and states of mind of complex creatures, its nature and how it developed through time. He focused on the distinction between the learned behavior of mature organisms (habit) and the unlearned behavior of newly born creatures (instinct). This principle has strong implications on the ontological status of consciousness, and on the veracity of the sense experience.

“That some physical change is produced in the nerve cells or nerves which are habitually used can hardly be doubted, for otherwise it would be impossible to understand how the tendency to certain acquired movements is inherited.”

((p. 39, Expressions)

Darwin argues that the stimulus/response causal relations between material objects located in time and space (i.e. conditions of life) and the nervous system of living organisms, cause physical changes to the material and structure of nerve cells of individuals. Some changes to some cells are permanent, and this modification is heritable and is passed between parent and offspring by ordinary generation.

Darwin's principle of habit and instinct has profound implications for our understanding of consciousness, mental causation, and personal identity, and will provide an argument for extreme materialism as discussed later in this essay. This modification of cells and the inheritance of modification argues for the mind/body identity theory. The body parts of perception (sense organs) and the states of consciousness of instinct (focus on movement, attraction toward the parent), are

passed from parent to offspring. The complex behavior of offspring is expressive of states of consciousness at the instance of birth. This inheritance can occur only if those states of consciousness are part of the material that divides from the parent and becomes the offspring. States of consciousness are heritable only if the mind and body are numerically identical.

Darwin's confidence in the veracity of sense experience is based on his argument that the sense organs of all sentient creatures are developed according to the principles of T/E. As knowledge is justified true belief; as belief is part of consciousness; as consciousness is the causal interaction of sense organs with conditions of life; as this interaction causes physical changes to cells that are passed on to offspring; human beings are justified in their confidence that sense experience is a correct and reliable source of knowledge.

2. Principle of Antithesis

Many states of mind have opposites, e.g., love/hate, pleasure/pain, happy/sad. Those opposite states also have opposite expressions, e.g., smile/frown, move toward/move away. Darwin's interest in antithesis seems to be an outdated remnant of 19th century thesis/antithesis metaphysics and political philosophy used to explain the structure of human societies and governments.

However, an important consequent of his discussion of this principle is showing how the same body parts express very different emotions. The purpose and burden of explanation is to identify the distinct and separate causes of distinct and separate effects. Darwin's strategy for understanding the common occurrence of opposite expressions of opposite emotions in humans is to examine the same relation between expressions and emotions in lower creatures. In particular, he was intrigued that this relation of opposite emotions (hostility/affection) with opposite expressions (hair raised/hair lowered) is heritable in humans and lower creatures. His understanding of mental causation, that is the relation between emotions and expression of emotions, is significantly connected to his understanding of inheritance. He seeks to show that opposite emotions and opposite expressions of emotions are explained by the principles of T/E. This antithesis of expressions which reveal antithesis of emotions is evidence in favor of T/E.

3. Principle of direct action

The principle of direct action seeks to explain the nature of the body, the nature of the mind and the relation between the two by exploring the process of causation between the stimulation of nerves and the expression of states of mind. What makes this explanation significant to the traditional philosophical discussion of the nature of consciousness and nature of mental causation is Darwin's argument that states of the body *and* states of the mind are instances of the general principles of T/E. He argues that all consciousness is a complex stimulus/response causal relation between body parts and that this relation has descended from very simple creatures according to the principles of T/E.

In Expressions, Darwin proposes a causal theory of perception and a causal theory of mind which maintain an unbroken chain of physical events in time and space between stimulation of nerves and consequent expression of states of mind. The contact of bodies which cause stimulation of nerves spreads through the sense organs to other body parts as a complex causal chain of neural firings and chemical reactions. The whole causal process between stimulation and consequent transmission of neural activity is the sensation, emotion and thought. The movements of expression in face, hands, voice and other body parts, are causally related to the stimulation of sense organs.

Darwin justifies these causal theories by examining the relation between simple organisms (bacteria, barnacles) and complex organisms (eagles, humans). He argues over and over again that the cause of certain similarities between organisms is descent from a common ancestor. He seeks to show that some body parts, some behavior, and some states of mind were gradually developed by means of slight gradations in very simple creatures and then passed between parent and offspring through ordinary generation and inheritance. This analysis of the development of sense organs and nervous systems assumes a realist theory of knowledge.

Darwin constantly uses this comparison of higher and lower organisms to argue for the veracity of sense perception as a source of knowledge. He defends this position by showing that the stimulus/response relation which causes visual sensation in simple creatures (mollusks) is identical to the stimulus/response relation which causes sensation in complex creatures (humans):

“The simplest organ which can be called an eye consists of an optic nerve, surrounded by pigment cells and covered by translucent skin, but without any lens or other refracting body.... Eyes of the above simple nature are not capable of distinct vision and serve only to distinguish light from darkness.”

(Origin, p. 169, 6th)

The strategy of comparing higher complex organisms with lower, simpler organisms is at the foundation of Darwin's T/E. By inserting the stimulus/response relation to any organ, he develops this argument:

“Reason tells me, that if numerous gradations from a simple and imperfect eye to one complex and perfect can be shown to exist, each grade being useful to its possessor, as is certainly the case; if further, the eye ever varies and the variations be inherited, as is likely certainly the case; and if such variations should be useful to any animal under changing conditions of life; then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable to our imagination, should not be considered subversive to the theory.”

(Origin, p.168, 6th)

This process of developing a complex eye from a simple stimulus/response causal relation between light rays and the nerve cells of very low organisms is an instance of the formal argument for Darwin's T/E. This argument pervades each of his books on evolution and is applicable to the development of all parts of all organisms through the entire history of life on earth:

1. For any organism, each organism is the offspring of a parent (ordinary generation)
2. If offspring vary from their parent (variation)
3. If that variation is heritable (inheritance)
4. If that variation gives advantage in the struggle for life (natural selection)
5. Then, that variation will be passed on to future offspring and will eventually become established (modification)

Darwin assumed a realist theory of knowledge which claims that: sense experience is a source of knowledge; both facts and general principles are knowable; knowledge is justified true belief. However, to call this theory an “assumption” is misleading because he devoted a great deal of time and study toward examining the relations between sensation, language, reality and knowledge. His

theory of knowledge is closely tied to his T/E and these theories influence each other. He argues over and over again that a stimulus/response causal relation between conditions of life and the receptors of very simple organisms, in accordance to the specific general principles of T/E, explain the development of all parts of all complex organisms. The parts of all current creatures., including the nerves and organs of consciousness, are descended from ancient creatures according to these strictly physical relations.

Darwin's assumptions of the veracity of sense perception, and the veracity of the correspondence between thought and reality, are defended in the development of his theory of evolution. The nerves and organs of consciousness are caused by the strictly physical relations of descent. Human sense perception is veridical, and human thought corresponds to reality, because current human beings descended from the original single cell organisms according to the rigid principles of T/E. This veracity and correspondence made necessary by descent justify the “assumptions” that facts are states of affairs that exist; that facts are knowable; and that the proponents of T/C and T/E share the same facts.

What is a theory?

Let's say you and a friend are sitting on a porch on a ranch near Big Timber, Montana, enjoying the summer evening, and suddenly you hear a large explosion. Both of you jump to your feet and exclaim, “What the hell was that?” The first thing you do is look at the sky for storm clouds which might cause a lightning strike nearby. However, the weather is calm and the sky is clear, what next? A most common and ordinary response is to brainstorm the various possibilities: Was it a plane crash? Was it a rupture in the nearby gas pipeline? Was it exploratory blasting at the East Boulder mine? Was it the long-feared eruption of the volcano beneath Yellowstone Park?

This example shows the basic relation between fact and theory: the fact is the explosion, and the theory is the attempt to identify why the explosion occurred. In more general terms, a fact is a state of affairs that exists, and a theory is an attempt to identify why and/or how that state of affairs occurred. (Note: if an event is expected to occur but does not occur, then we also attempt to identify

why/how a certain expected fact did not occur. Non-occurrence, absence and prevention are also facts subject to theorization.)

The questions “Why?” and “How?” are closely related, and Darwin used them equally and interchangeably:

“...with the theory of descent...we can thus understand how it is that new species come in slowly and successively; how it is that species of different classes do not necessarily change together or at the same rate, or in the same degree...we can understand why, when a species has once disappeared it never reappears...we understand why the more ancient a form is, the more generally it differs from those now living...”

(Origin, p.136, 6th)

Usually we hear the word “theory” in relation to specific academic subjects of science and mathematics. Astronomy has the big bang theory concerning the formation of stars and galaxies, medicine has the germ theory of disease concerning the transmission of illness, psychology has the Freudian theory of personality development, economics has the supply side theory of economic market forces, physics has the theory of relativity addressing the effects of distance and gravity on light, and so on. Every discipline has sets of competing theories with proponents and opponents of each.

The discussion of theories of any science is usually reserved for the collection and comparison of data, and the discussion usually takes place between experts in particular fields. This focus on the theorization of advanced science deludes us into thinking that “theories” are something academic and reserved for experts of various subjects. However, in order to grasp the full weight of Darwin’s Argument, it’s important to recognize that all theories of all subjects share a common structure with the logic of ordinary rationality.

Every moment of every person’s life is full of innumerable facts – we are surrounded and participate in a dynamic relation of objects. We frequently select some of those facts and ask how or why those facts occur (Why won’t my car start?). A common way, if not the only way, to provide an answer to the question “how/why” is to show that a fact was caused to occur by previous conditions related to that fact (My car won’t start because the battery is dead). Further, a common way, if not the only way, to show why a fact occurred (My car won’t start.) is to show that it is an instance of a

general proposition that is true (My car has a dead battery, and all cars with dead batteries don't start.). Darwin had a very fundamental and common method of theorization – a theory is the attempt to identify the cause of a fact. One of the great misunderstandings of Darwin's Argument is expressed by the proponents of Creationism, or Intelligent Design, when they claim that evolution is “just a theory.” In ordinary language, the claim that any theory is “just a theory” is itself just a theory and is intended to weaken and diminish the proponent of the claim. The claim that evolution is “just a theory” is a trivial truth because the same can be said of Intelligent Design – it's “just a theory”. In Darwin's notion of theorization, all theories about any facts are equal because any theory about any facts is simply the attempt to answer the question how/why any fact occurred. In the end, what makes one theory different from another theory, what makes one theory better than another, is whether the theory is correct and true. Determining truth is the hard part.

Consequently, for the purpose of understanding DA, a theory is a set of propositions that attempts to identify the cause of a fact. What makes a theory true is whether it corresponds to reality and correctly identifies the cause of a fact. In DA, both T/E and T/C are theories, and Darwin's enormous burden was to show that T/E is true and T/C is false.

What is explanation?

In each of Darwin's books on evolution, he uses the terms “explain”, “make intelligible”, “comprehend”, “understand”, “accord with”, and “account for” interchangeably.

“So it is with the mouths of insects, we have only to suppose that their common progenitor either had an upper lip, mandibles, and two pair of maxillae, these parts being perhaps very simple in form; and natural selection will *account for* the infinite diversity in the structure and functions of the mouths of insects.”

(Origin, p 405, 6th)

“The community of expressions in distinct though allied species, as in the movements of the same facial muscles during laughter by man and by various monkeys is rendered somewhat more *intelligible* if we believe in their descent from a common progenitor.”

(Expressions, p. 23)

“Let us see how far these several facts and inferences *accord with* the theory of descent with modification.”

(Origin, p. 326, 6th)

“It is a truly wonderful fact – the wonder of which we are apt to overlook because of familiarity – that all animals and all plants through out all time and all space should be related to each other in group subordinate to group, in the manner which we everywhere behold.... on the view that each species has been independently created, I can see *no explanation* of this great fact in the classification of all organic beings; but, to the best of my judgment, it is *explained* through inheritance and the complex action of natural selection.”

(Origin, p.140, 1st)

In order to understand Darwin's notion of explanation, it's important to understand that his fundamental assumptions maintain a relation of necessity between propositions and propositions (logic), between propositions and facts (truth), and between facts and facts (causation). He assumes that certain laws of mathematics and logic are true of reality, that propositions correspond to reality and that reality is structured according to a framework of general causal principles.

To “explain” is to show how/why a fact does occur. One way (and I think it was Darwin's way), if not the only way, to show why a fact does occur, is to show why a fact must occur. To show why a fact must occur is to identify conditions that, if satisfied, force the fact to occur by making the fact necessary, or, if not satisfied, prevent a fact from occurring by making it impossible. However, to understand this, we need to understand what necessity is and what it is that makes a fact necessary.

We claim that food, clothing and shelter are the “necessities of life” and if you are denied any of them, you will suffer and die. Without water, you will die. We claim that the statement “ $2 + 2 = 4$ ” is necessarily true and “ $2 + 2 = 5$ ” is necessarily false, no matter how you use them or any other condition of life. We claim that the statement “A rose is a rose.” is necessarily true and that “A rose is not a rose.” is necessarily false and nothing can be done to change that status. The term “necessary” means and implies an extreme, uncompromising state of affairs that cannot be otherwise, whose denial is unimaginable and impossible. Necessity establishes a limit that is basic, rigid and

unalterable. These examples indicate that there are at least three forms of necessity: mathematical, logical and causal.

Assumption 3: Math and logic

There is little argument about the necessity of mathematics. If a child takes a test and writes “ $4 + 7 = 15$ ” we say they're wrong, and even if they think they're right, they're wrong – the correct answer is “ $7 + 4 = 11$ ”. The same form of necessity forces the validity of the proofs of arithmetic, geometry, algebra and calculus. An important aspect of mathematical necessity is that the formal elements of mathematical statements (theorems, proofs, numbers, figures) do not need practical applications, nor physical instances. The force of mathematical necessity is independent of the existence of physical objects in time or space. The math statement “ $7 + 4 = 11$ ” is true independently of whether putting seven apples in a box, then adding four more apples, results in a box of eleven apples.

However, many formulas of arithmetic and geometry do have practical applications in the physical world – every time you add seven items and four items, you will have a total of eleven items. According to a realist theory of mathematics and a correspondence theory of truth, as was the case with Darwin, the explanation of the correspondence of objects and numbers was not because of a psychological generalization of many examples of addition, nor because of what we mean by the words “seven”, “four” and “eleven.” What makes the formulas work, and the statements true, is a correspondence between statements and the structure of the physical world. Reality makes the formulas true.

Much the same can be said of the necessity of logic. The above quote “...all plants and all animals throughout all time and space...” points toward the general principles of propositional logic which form the foundation of Darwin's Argument and are essential to what he means by “explains.” He maintains that the laws of classical logic;

modus ponendo ponens:

1. if x, then y
2. x
3. [therefore] y

and modus tollendo tollens:

1. if x, then y
2. not-y
3. [therefore] not-x

are true of the material world. Not only in formula, but also in our everyday lives, if certain conditions are satisfied, then a certain consequent is made necessary and must follow. Further, Darwin relies upon these classical laws of propositional logic to govern the instantiation of the above general principles:

1. Law of Identity:

For any proposition "P", the statement "If P, then P" is true. In relation to instantiation in the real world, for any entity X, the statement "X is X" is true. Each thing is identical to itself. Each chicken is that chicken.

2. Law of the Excluded Middle

For any proposition "P", the statement "Either P, or not-P" is true. In relation to instantiation in the real world, for any entity X, the statement "X is either X, or not -X" is true. Each thing is either itself, or not-itself. For any specific object, that object must have those specific properties, or not have those specific properties. Each chicken is either that chicken, or not that chicken.

3. Law of Non-contradiction

For any proposition "P", the statement "not-(P and not-P)" is true. In relation to instantiation in the real world, for any entity X, the statement "X cannot be both X, and not-X" is true. An object may change its properties in time and space, but this law makes necessary that at any particular time and space, an object cannot both have those properties, and not have those properties. For each chicken, that chicken cannot both be a chicken, and not be a chicken.

This assumption about math and logic is controversial. In contemporary philosophy there is much dispute about how the modalities of possibility and necessity apply between the axioms of mathematics, the rules of propositional logic, ordinary language and the reality of physical objects in time and space. The concepts of time and space are themselves in flux. However, there is widespread agreement that, within the disciplines of math and logic, axioms and rules can be given, and then the move from premises to conclusion is a form of necessity. It is less clear whether the same relation of necessity connects objects and events of our everyday lives. An important question concerning Darwin's sense of explanation is whether the relation of necessity which obtains between the axioms, premises and conclusions of math and logic also obtains between the material bodies and events of the real world of time and space.

One of the main grounds for claiming that the necessity of math and logic is different from the necessity of the relations of objects in time and space is that denying a true premise or a valid conclusion in propositional logic, "not-(if p, then p)", or a true premise or a valid proof of mathematics, "not-($2 + 2 = 4$)", is contradictory. Whereas, to deny a true statement about objects in time and space, whether that statement is specific ("Socrates is mortal"), or general ("All humans are mortal"), is not contradictory. However, is this fact about contradiction sufficient to show that the necessity of math and logic is not identical, or is somehow weaker than the relation of causation between existing states of affairs? I don't think so.

Assumption 4: Causation

What is it that makes the statement " $7 + 14 = 21$ " true? Mathematical truth consists of using certain symbols and following certain rules to arrive at conclusions that are determined by the rules. " $7 + 14 = 21$ " is true because it is an instance of the rules of arithmetic. The rules cause the statement to be true – if the truth of the rules is given, and if the statement is an instance of the rules, then the truth of the statement is necessary.

What is it that makes the statement "If x, then y; x; therefore y." true? Logical truth consists of using certain symbols and following certain rules of logic to arrive at conclusions determined by those rules. The rules cause the truth of the conclusion – if "If x, then y" is true, and if "x" is true, then the laws force "y" to be true. If the rules are assumed to be true, and if the proposition is an instance of the rules, then the conclusion is necessarily true.

What is it that makes the statement “There is a starfish in the tide pool.” true? Darwin thought deeply about language and the systems of nerves and organs by which language is expressed. His T/E has extreme consequences for understanding the relations between words, objects and meaning. In the current context of attempting to identify the philosophical assumptions he used to evaluate T/E and T/C, I think it is accurate to use a traditional notion of sense and reference in which the nouns “starfish” and “tide pool” refer to the objects of starfish and tide pool, and that an essential part of the meanings of these terms are the criteria, or list of properties, that an object must have in order to qualify as an instance of the term.

For example, in order for an object to be a starfish, it must be an object and it must have certain properties – appendages, organs and other parts. In order for something to be a tide pool, it must be an object and it must have certain properties – a body of water along the shore of a larger body of water that is affected by the flows of tides. The adverb “in” describes the relation in the framework of space such that the starfish is contained within the borders of the pool of water.

Consequently, if there is a starfish, and if there is a tide pool, and if the starfish is inside the tide pool, then the statement “There is a starfish in the tide pool” is true. The statement is made true by the fact. The fact proceeds and causes the truth of the statement. If the statement is true, then the fact to which the statement refers or describes must obtain, must be the case.

How about the statement “The lightning caused the fire.”? For the purposes of evaluating T/E and T/C, the analysis is the same: the nouns “lightning” and “fire” refer to the objects lightning and fire and an essential part of the meanings of the terms are the criteria the objects must satisfy in order to qualify as instances of the terms. The verb “caused” refers to a relation between the object lightning and the object fire such that the occurrence of one object forced, or made necessary, the occurrence of the other. Consequently, the statement “The lightning caused the fire.” is made true by the fact that the lightning caused the fire. The fact precedes and causes the truth of the statement. If the statement is true, then the facts to which the statement refers must obtain, must be the case.

We frequently use the term “cause” as both a noun and a verb in ordinary language. As with math and logic, the truth of ordinary language still consists of using certain symbols (written and spoken words, gestures, communicative behavior) and following certain rules (structure of sentences, dictionary meanings of words, appropriate gesture) to arrive at conclusions that are determined by those rules. The main distinction between math, logic and this third kind of necessity – causation – is that causation is a relation between things that exist in the physical world of time and space.

Some things that exist are instances of the rules of description of ordinary language, e.g. if my chair is blue and has four legs, then the statement “My chair is blue and has four legs.” is true. The state of affairs causes the statement to be true. The same can be said about our frequent claims about causation. For a particular wildfire near Big Timber, if the lightning caused the fire, then the statement “The lightning caused the fire” is caused to be true by the fact. The world causes the truth of statements about the world. If objects or events are facts, and if they are instances of general causal laws that are true, then the relation between these facts is necessary – just as necessary as the conclusions of math and logic.

This discussion about truth and necessity is oversimplified and controversial. However, the main point I want to get across about Darwin's philosophical assumptions concerning causation is that, for him, the relation of necessity between cause and effect is the same as the relation of necessity between the premises and conclusions of math and logic. The main difference is that, with math and logic, the truth of the premises is assigned, whereas with causation, the truth of the premises is discovered. The truth of the claims to causation is determined by the relations of facts in the world. There are not different kinds of truth, but there are different kinds of statements (mathematical, logical, causal), and different ways of knowing the truth of these statements.

Darwin was convinced that the physical world of time and space in which we find ourselves is structured and organized according to general causal principles which long preceded all human intelligence, and which could be discovered and known to be true.

“As the late Edward Forbes often insisted, there is a striking parallelism in the laws of life throughout time and space: the laws governing the succession of forms in past times being nearly the same with those governing at the present time the differences in different areas.”

(Origin, p. 422, 1st)

This conviction about the structure of reality is essential to his notion of explanation. To explain is to discover the conditions that make a fact occur and to show that facts are instances of those conditions. To explain is to identify instances of general propositions that are true.

Darwin's process of explanation is essential to his method of theorization, and is the purpose of the Origin, Variations, Expressions and Descent. He sought to explain certain facts about living things by identifying general causal principles of which those facts are instances. As a causal realist,

he maintained that reality is organized and structured according to certain laws of causation, and he tried to find them.

As expressed previously in this section, Darwin's assumption concerning causation relies upon certain laws of propositional logic in which variables represent groups of individuals, and logical form expresses a relation of necessity between variables. The logical form of general causal principles is an important restriction upon reality, but it is not the only restriction. In relation to logical form, a traditional way to understand causation is in terms of necessary and sufficient conditions: sufficient conditions have the logical form of modus ponens: (if X, then Y, X, therefore Y) and necessary conditions have the form of modus tollens: (if X, then Y, not-Y, therefore not-X). To say that a cause is a necessary and sufficient condition for an effect is useful because it gets at the force and strictness of necessity; it refers to an important common assumption of our understanding of the relation between logic, language and reality. However, causation is not a logical relation; while logic is a relation between symbols and rules, causation is a relation between things that exist.

There are two major differences between the laws of logic and the laws of causation. First, whereas with logic, the general propositions are independent of time, with causation, the cause must precede the effect in time (however, some philosophers argue that effects can also be simultaneous); and second, with logic, the truth of the premises is assigned and given, while with causation, the truth of the general principles is discovered, or justified by means other than assumption, and the possibility always remains that the principle is false.

The two main ways of justifying a general causal principle are, first, providing examples, and second, providing counterexamples. Justification by means of example is grounded in the logical form of modus ponens, and justification by means of counterexample is grounded in the logical form of modus tollens.

“I believe that the hive-bee has acquired, through natural selection, her inimitable architectural powers...this theory can be tested by experiment.”

(Origin, p. 226, 1st)

As with this example of the honey bee, under his broad “classes of facts,” Darwin provided innumerable specific examples of his general principles of descent. His experiments, tests, and predictions provided data that lent support for his claims that the principles of T/E are true. These

specific examples served as instances of the variables in the causal law “If X, then Y”. Over many years of observation and confirmation, the weight of support provided by examples gradually builds, and truth becomes more and more evident. Examples are part of justification.

"If it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory, for such could not have been produced through natural selection."

(Origin, p. 202, 1st)

and:

"We have seen...that whole groups of species sometimes falsely appear to have been abruptly developed; and I have attempted to give an explanation of this fact, which if true would be fatal to my views."

(Origin, p. 316, 6th)

Throughout the Origin, Darwin frequently examines two kinds of counter-examples to T/E. First, he describes states of affairs that, if they were facts, would be “fatal to my theory” (e.g. if any part of any organism appeared suddenly). He then shows that a proposed fact is not a fact. And second, he examines proposed theories about the causes of facts which, if the proposed theory were true, then his theory would be false (e.g. that the beauty of nature was created for the good of man, that relations between organisms work according to a plan). He then provides evidence that the proposed theory is a false theory. Counterexamples are also part of justification.

These uses of example and counterexample show an important aspect of causation: while with the premises of math and logic, the symbols are thoroughly general and truth is assigned, with causation, the general laws have instances and must be shown to be true; that is, justified by other means than assumption. This requirement for justification also guarantees that the proposed general principle may be false. If a proposed theory is so general that it must be true and cannot be false, then it is either circular or non-factual. A theory is circular if the premises are logically necessary, and a theory is non-factual if it cannot have identifiable instances. A causal theory must be distinguishable in fact and meaning from its negation. Examples and counterexamples help make that distinction between true theories and false theories.

Science vs. Religion

In the past several hundred years, humans have made great progress in science and technology. The process of theorization and justification has been dominated by science and conducted by professional scientists. The motions of distant stars, communication of disease, mapping a human genome, size and efficiency of computers, the structure of our brains, splitting the atom.....have all been subjects of trained professionals. Strict rules of justification regulate data collection, analysis, publication, peer review and acceptance into vast bodies of knowledge of each branch of science. Science has become a special development area and storage space for the details of how things are organized and why things work.

However, the special status of science is a recent illusion that distracts us from the fundamental rationality of our everyday lives. Science should not be viewed as regulated by an elite body of special experts deserving special respect. Rather, the methods and experts of science need a historical perspective. Although extremely complex and sophisticated, modern science has developed on a continuum of ordinary common sense.

If we rate the participation in the methods of scientific research of a scale of 1 to 10, a professor of physics at MIT, and the lead researcher for developing a bird flu vaccine at the Center for Disease Control and Prevention in Atlanta, would receive a 10. They have advanced degrees in their subjects, they're experts in their field, they devise controlled tests to collect data and devise theories to explain facts, they get paid to use and contribute to the bodies of knowledge related to their fields – they're professional scientists.

Also, in a very fundamental level, during every day of our lives, the rest of us are at least a 1 on the same scale. If you want to have a cold beer, you go to the refrigerator and look inside, you don't go to the stove and look inside – that's science – refrigerators cause cold beer. If you wonder whether to take an umbrella on your walk, you look at the sky to see if clouds are approaching – that's science – clouds make the rain fall. Before jumping in the lake, you test the water with your toe to see how cold it is – that's science – water temperature is a fact that is discoverable through testing.

Science has become very elevated, successful and isolated in these modern times. Scientists have become figures of authority that disappear into sterile buildings and have access to special knowledge that is beyond the comprehension of the person in the street. The quantity and complexity

of theories and data make that vision of science partially accurate - it's all so complicated. However, in order to understand Darwin's argument, in order to understand what he means by “fact,” “theory” and “explanation,” it's essential that we keep in mind that, for Darwin, the basic role of science is to explain how/why certain facts occur by identifying the causes(s) of those facts. Science has moved to the far end of the spectrum, but it is still on the same continuum of rationality that everyone does every day – to say what happened and why – to identify the cause of a fact.

I've grossly oversimplified many issues - science, religion, causation, explanation, rationality - and the reader may think “This is ridiculous - looking into a refrigerator is not science, touching the water with your toe is not science - science is for scientists with special tools and special training.” However, the purpose of this oversimplification is to clearly reveal Darwin's philosophical assumptions and the radical consequences of his argument. To examine these basic assumption helps us to understand why he compares T/E with T/C and what is at stake in the comparison. In order to understand Darwin's own notion of T/E, its essential to grasp the fact that, in his view, T/E and T/C are equal and they each try to do the same thing – to explain facts by identifying the cause(s) of those facts.

For Darwin, religion is science, albeit early science, because religion identifies a set of facts and then claims to identify the cause of those facts – that's what science does. T/C is a theory that claims to identify the cause of certain facts. T/C claims to explain the origins and purpose of life on earth, particularly the status of human beings, by identifying the cause of life, and particularly, the cause of human life.

T/E also claims to explain the origins and purpose of life on earth, particularly the status of human beings, by identifying the cause of life, and particularly the cause of human life. Due to his philosophical assumptions, Darwin requires that both T/C and T/E be judged by the same criteria of truth and evaluated by the same process of justification. Darwin argues that if so judged, T/E does identify the cause of facts and T/C does not identify the cause of facts. What makes Darwin's argument so radical is that it concludes that because T/E corresponds to reality, T/E is true; and that because T/C does not correspond to reality, T/C is false. There can be no doubt that, in Darwin's mind, his “one long argument” is between competing and incompatible theories.

Summary of Section I

From the moment the Origin was published until the present day, Darwin's argument has been rife with bitter controversy, yet there has been little analysis of the exact points of dispute. DA makes the apparently simple claims that T/E explains facts and T/C does not explain facts. In order to understand and judge DA, I have attempted to clarify Darwin's concepts of fact, theory and explanation. These concepts are very complex and are grounded upon a set of philosophical assumptions concerning logic, truth, knowledge, causation, identity and evidence.

The success of DA depends partly upon the facts about living things, however, a great deal also depends upon the understanding of these facts. Both proponents of T/E and proponents of T/C bring philosophical assumptions to the table, and in order to understand each other and locate the exact point of dispute, we need to expose and analyze these assumptions.

In my reading of Darwin's works on evolution, these are the concepts and assumptions he uses to formulate his T/E:

A fact is a state of affairs that exists. A theory is a set of general principles of which facts are claimed to be instances. Explanation is a set of propositions which attempt to answer the question of how/why a fact occurred. A theory attempts to explain a fact by identifying the cause of that fact. To identify the cause of a fact is to identify a set of conditions that force the fact to occur by making the fact necessary. A fact is made necessary by being an instance of a general principle that is true.

Consequently, for Darwin, both T/E and T/C claim to explain facts by claiming to identify the cause(s) of these facts. Each theory makes claims about causal relations that are either true or false. The burden of explanation is to show that what is claimed to be the cause of a fact actually is the cause. In order lift this burden, each theory must show that its claims are true. Showing that a claim is true requires the process of justification. To justify a claim consists of providing evidence that the claim is true. Both T/E and T/C seek to justify their claims by providing evidence that their claims are true.

Each of these steps in the evaluation of T/E and T/C depends upon Darwin's philosophical assumptions. Far from the charge of being an elite academic exercise, each of us, every day, use and depend upon philosophical assumptions concerning logic, truth, knowledge, causation, identity and evidence. I have touched upon each of these assumptions and will further unpack them in the following sections. So far, I have tried to show that Darwin assumed a correspondence theory of truth in which truth consists of a causal relation of correspondence between facts and propositions; a realist theory of knowledge in which knowledge is justified true belief; a realist theory of math and logic in

which reality is structured according to certain principles that are knowable; and a realist theory of causation in which causation is a necessary connection between cause and effect such that facts are made necessary by being instances of general propositions that are true. Two more assumptions will be addressed later; a realist principle of identity which establishes conditions for identifying causes; and a realist principle of evidence in which one specific fact serves to identify a causal relation between different and separate facts.

The hope of Section I is that, even before examining the actual facts and theories of DA, all parties of the dispute will either agree on the meanings of the terms and formulation of the assumptions, or, if we disagree, we can locate the point of disagreement.

Section II:

What are the Facts?

At any point in time, there are innumerable facts about the world in which we find ourselves; it's a fact that my pencil is getting dull and that a pencil sharpener is attached to the wall of my office. However, those two facts are not relevant to DA. When Darwin claimed that “T/E explains facts,” he is only talking about certain kinds of facts, not all facts. The Origin is organized according to the large “classes of facts” that he considered relevant to the two theories.

“Many large groups of facts are intelligible only on the principle that species have been evolved by very small steps”

(Origin, p. 226, 6th)

What are Darwin's classes of facts?

1. Geology

One of the great difficulties of each theory is that they seek to account for, make intelligible, and explain events that occurred over an enormous period of time. There was no one around to see things happen and keep a record. However, some objects that existed, and were parts of events long ago, still exist today. The Origin examines in detail the formation of geological strata, the rise and fall of oceans in relation to climate change, glaciation and the ebbs and flows of tide, the movement and connections of landmass, the roles of coral and volcanoes in the formation of islands. Darwin uses these facts and theories of geology to examine and understand how organisms alive today are related to the organism that were alive long ago.

The most important fact about fossils is that they are literally parts of once living things that were preserved by the geological conditions of the time. Fossils were once alive. The collection of all the discovered fossils from all parts of the earth make up the fossil record.

Both T/E and T/C seek to explain the facts of the fossil record. Both theories use facts from the fossil record as evidence to justify their general principles by claiming to identify the causes of the facts. T/C claims that the great dissimilarities between the fossilized remains of a Tyrannosaurus Rex discovered in Montana and the human being that works at the checkout counter of a local grocery store are evidence that these different organisms appeared suddenly in space and time and were created, or caused, by god the creator. T/E claims that the dissimilarities between current organism and fossils did not appear suddenly, and that the parts of all current living things developed

gradually according to the principles of evolution; ordinary generation, inheritance, variation, natural selection and modification. T/E claims that the fossil T-rex and the current grocery store checkout clerk are linked by a necessary causal chain of descent from a common ancestor.

Darwin claimed that these facts of geology, in relation to the fossil record, are explained by T/E:

A. Transitional forms do occur in the fossil record. New fossils are continually discovered and each fossil fits at least somewhat coherently in the causal chain of the fossil record. Although the record is far from complete, on the continuum of time from current living things to the most ancient life, each fossil discovered today can be dated, located and related to other fossils. T/E claims that members of the current classes of vertebrates (fish, reptile, amphibian, bird, mammal) each descended from a water breathing, four lobed, fishlike ancestor. Since the Origin, many fossils have been discovered that are instances of these transitional forms.

B. Predictions concerning the location and properties of fossils are often true. Fossils are often discovered when and where the organisms are predicted to have lived. For example, facts concerning the movement of earth's landmass and the location of marsupial fossils provided evidence for the prediction of the 1982 discovery of marsupial fossils in Antarctica (p. 95, Coyne). Darwin's own prediction concerning the location of the origin of humans led to the 1924 discovery of early human fossils in Africa:

"We are naturally led to inquire, where was the birthplace of man at that stage of descent when our progenitors diverged from the Catarhine stock? The fact that they belonged to this stock clearly shows that they inhabited the Old World; but not Australia, nor any oceanic island, as we may infer from the laws of geographical distribution. In each great region of the world the living mammals are closely related to the extinct species of the same region. It is therefore probable that Africa was inhabited by extinct apes closely allied to the gorilla and chimpanzee; and as these two species are now man's nearest allies; it is somewhat more probable that our early progenitors lived on the African continent than elsewhere."

(Descent, p. 182, also Coyne, p. 96)

The many true predictions concerning the age and location of fossils provide evidence that the general principles of T/E are true.

C. Just as any offspring is literally constructed from parts of its parent, each younger fossil is built from the parts of an older fossil. Each generation of organism is made from the parts of previous generations. Any part of any current organism – be it flower, root, leg, wing, brain – is literally made from the material and structure of its parent; and that parent from its parent; and that parent from its parent; on down the line.

Darwin frequently uses the term “plastic” to refer to the modification of parts between species. T/E entails that for any part of any individual of any class, that part was inherited, with slight variations, from its parent. The changes that develop in offspring are built upon the parts that exist in the parent.

We observe the fact that new parts are modified forms of old parts when we examine the relation between current organisms and younger fossils, and between younger fossils and older fossils. The skulls, brains and backbones of current humans didn't appear suddenly from nowhere, they were built from the skulls, brains and backbones of very different creatures over the course of many millions of years. Over many generations, the cranium part of the skull becomes larger, as the creature begins to move upright, the hole through which the spinal cord is attached to the brain (foramen magnum – p. 199, Coyne) moves forward, and the relation of the femur to the pelvis moves to accommodate its upward posture.

In the Origin, Darwin argues that the complex eye of any current lobster, or any current eagle, was built upon a simple organ in an ancient sea creature the responded to light.

"I can see no very great difficulty...in believing that natural selection has converted the simple apparatus of an optic nerve merely coated with pigment and invested by transparent membrane, into an optical instrument as perfect as is possessed by any member of the great Articulate class”

(Origin, p. 190, 1st)

He applies the same argument to any part of any current living thing: all parts of current organisms are built upon, formed from, the parts of earlier organisms by means of numerous, successive, and slight changes.

Although strange and nearly unimaginable, T/E claims the fossil record as evidence for the truth of its principles. The fossil record is a set of facts which relates living things through time and space. Although sometimes incomplete and speculative concerning where any one fossil fits in the

record, these facts – that transitional forms do exist, that fossils are discovered when and where predicted, that parts of later organisms are constructed from parts of earlier organisms – are explained, made intelligible, and accounted for by T/E.

2. Geography

Geography identifies and explains the locations of things on the surface of the earth. In the Origin, Darwin commits two chapters to the “great facts” of geographical distribution as evidence supporting T/E.

A. The similarity and dissimilarity between living things is independent of the similarity and dissimilarity of their surrounding environment.

Regions of North and South America, Europe, Africa, India and Australia have very similar terrain, rainfall, length of seasons, and altitude, yet each are populated with very different plants and animals. The great plains of North America were populated by bison and cottonwood trees, the great plains of Africa by zebras and baobab trees, the great plains of Australia by kangaroos and eucalyptus trees. The similarity and differences between organisms in each of these regions was not determined by the conditions of life.

Yet, within each of these continents, while the conditions of terrain, rainfall, seasons, and altitude are very dissimilar, the organisms within a vast contiguous area are very similar in that they are variations of the same species. In North America, rattlesnakes live in the near tropical everglades of Florida, the desert rims of the Grand Canyon, the forests of Pennsylvania, and the prairies of Montana. The same is true of the cats of Africa, the frogs of India, the trees of Australia and innumerable plants and animals in all regions on earth. The kinds of organisms which populate separate bodies of land and water is determined, not by the conditions of life, but by the physical contact between the organisms.

B. Barriers to the migration and physical contact between organisms affect the population of each region. Organisms on one side of a barrier are different from organisms on the other side of the barrier.

Fish surveys on the East Boulder River of Montana show that the native and less aggressive cutthroat trout is the predominant species above a large waterfall, while the introduced and more

aggressive brown and rainbow trout predominate below the waterfall. The waterfall is a barrier which protects the cutthroat trout from the brown and rainbow trout.

Land is a barrier to marine organisms; water is a barrier to terrestrial organisms.

Mammals on one side of the Himalayas are different from mammals on the other side.

The effects of barriers on the properties of organisms on either side of the barrier is evidence that the dissimilarities between the groups on either side is caused not by creation from nothing, but rather, by the physical contact of ordinary generation.

C. For nearly any ecosystem with a particular set of conditions (air, sunlight, water, temperature, altitude, etc.) as you change location and move from one set of conditions to another, the groups of plants and animals also gradually change. As conditions change between the inside and the outside of a cave, from wetland to dryland, from north to south, from lowland to highland, the populations of organisms will change concurrently.

As you walk from Half Moon Campground in the Crazy Mountains near Big Timber, MT (elevation: 6000'), to the top of Crazy Peak (elevation: 11,000'), the species of fir tree change gradually from Douglas fir to sub alpine fir. As conditions slightly change in these higher elevations, the subalpine fir diverge further to form two subspecies, *A. lasiocarpa* and *A. biofolia*. (see Manual of Montana Vascular Plants, by Peter Lesica, p.75)

D. Although closely related to the sets of geographical facts mentioned above, facts concerning oceanic islands were particularly influential on Darwin's development of T/E. Oceanic islands provide particularly good evidence about where living things come from and how they are related.

First, the species of oceanic islands are most closely related to the species of the nearest mainland. For example, although the rheas, finches, iguanas, crabs, beetles, tortoises, and cactus of the Galapagos Islands are separate species that can only be found on these islands, their parts are more similar to the plants and animals of South America than the plants and animals of Africa or Australia. This similarity is evidence that the island was once a part of the mainland, or that the organisms somehow migrated from the mainland, and the organisms on the island diverged and developed from organisms on the mainland according to the principles of T/E.

Second, oceanic islands have fewer species of plants and animals than a similar sized area with similar conditions within any continent. For example, before European colonization, New Zealand had fewer kinds of plants and animals than did Africa or Australia.

Third, although islands have fewer species than continents, their proportion of endemic kinds (those found nowhere else in the world) is often very large. At Darwin's time, of the 26 species of land bird on the Galapagos Islands, 21 to 23 were peculiar to the area.

Fourth, oceanic islands are often deficient of whole classes of plants and animals. Although conditions were suitable, the islands of Madeira, Azores, and Mauritius had no Batrachians (frogs, toads, newts). Many islands - New Zealand, Norfolk, Viti, Bonin, Carolina, and Marianas - had only aerial mammals (bats) but no other terrestrial mammals.

Fifth, species on oceanic islands frequently have useless parts. For examples, the seeds of some plants have hooks that had been evolved for snagging the fur of a mammal, even though there had never been mammals on the island. Some beetles and birds have shriveled and useless wings, even though they are incapable of flight.

Before developing T/E, Darwin travelled the world, made observations and identified facts about the living things in various locations under various conditions. These geographical facts were part of the raw material that had profound influence in his search for an explanation of how and why things are the way they are. These facts formed the foundation of Darwin's dawning conviction that no matter where located, current organisms have migrated across the earth and that each organism was necessarily related through time and space to some common ancestors of long ago.

3. Morphology

Morphology is the study of the form and structure of organisms. This study identifies the parts (bones, organs, leaves, roots) and organization of parts (location, number, size, shape) both within any particular individual and between groups of individuals of different types. By examining the similarities and dissimilarities of parts, morphology makes claims concerning the relationships between individuals and groups.

“What can be more curious than that the hand of a man, formed for grasping, that of the mole for digging, the leg of a horse, the paddle of a porpoise, and the wing of a bat should be constructed in the some pattern, and should include similar bones, in the same relative position? How curious it is...that the hind feet of kangaroos, which are so well fitted for bounding over the open plains – those of the climbing, leaf eating koala, equally well fitted for grasping the branches of trees – those of the ground dwelling, insect or root eating bandicoots – and those of some other Australia marsupials –

should all be constructed on the same extraordinary type, namely with the bones of the second and third digits extremely slender and enveloped within the same skin, so that they appear like a single toe furnished with two claws. Notwithstanding this similarity of pattern, it is obvious that the hind feet of these several animals are used for as widely different purposes as is possible to conceive. This case is rendered all the more striking by the American possums (the only marsupial outside of Australia and Madagascar), which follow nearly the same habits of life as some of their Australian relations, having feet constructed of the ordinary plan (like American mammals, having hind feet with five digits and opposable thumbs)."

(Origin, p. 404, 6th)

The similarity of structure between very different creatures is also present in the construction of the mouths of insects; the long, spiral proboscis of the sphinx moth, the folded proboscis of the honeybee, and great jaws of the stag beetle, are variations of the same parts – an upper lip, mandibles and two pair of maxillae.

Darwin gives a long list of striking facts concerning the morphology of higher and lower organisms; the relation between the mouth and legs of crustaceans; between the right side and left side of animals; between front and hind limbs; between skull and vertebrae, between the sepals, petals, stamens, and pistils of flowers. What made Darwin radical and distinct was his relentless and fearless pursuit of explanation. Why are some parts of very different creatures so very similar? How did it happen?

As with the facts of geology and geography, Darwin claims that the facts of morphology are explained by T/E. A theory explains facts by identifying general principles of which facts are instances. To explain a fact is to identify the states of affairs and the general principles that force the fact to occur. The hard part of explanation is to determine that the explanation is true. What makes an explanation true is that the state of affairs that is claimed to be the cause does exist, that it is an instance of the relevant general principle, and that the general principle is true. Fact plus true principle equals true explanation.

Why does the hand of a man have the similar structure as the foot of a horse, the flipper of a seal, and the wing of a bat? Why do crustaceans with more complex mouth parts have fewer legs and those with fewer mouth parts have more legs? Why are the parts of current organisms similar to the parts of earlier organisms? Darwin claims that these facts are caused, are made necessary, by a set of

general principles that are true. Strange as it sounds, T/E claims that very different organisms have very similar morphology because at one specific time and place in the ancient past, they had the same parent.

4. Embryology

Each multiple cell organism that is alive today began its life in an early stage, as young. As time goes by, each living thing gets older. Embryology is the study of the very earliest stages of multiple cell organisms – the form these organisms take before maturity, before youth, and before birth. Whether in seed, cocoon, larvae, egg or placenta, embryology examines the very earliest forms of life between conception and birth.

When the Origin was published, embryology itself was in an infant stage. However, the facts Darwin collected are still facts and had great influence in the development of T/E. It must also be kept in mind that those facts are generalized over large groups of individuals and that some of these generalizations have counter examples. One of the great strengths of DA is that he recognized some of the instances of counterexamples, and yet demonstrated that even counterexamples were caused by, and explained by, the principles of T/E. These are some of the facts of embryology which influenced the development of T/E, and which Darwin maintained are explained by T/E:

First, embryos are formed, develop and gradually change through time. In most cases, an embryo or larvae is very different in appearance and structure than its parent. As it grows and matures, it gradually changes in appearance and structure.

Second, the embryo grows and develops properties at the same rate and in the same stages as did its parent(s) when it (they) was an embryo.

Third, the embryos and larvae of different species are very similar in appearance and structure.

Human embryos are nearly indistinguishable from the embryos of dogs, frogs, and chickens. The foreleg and hind leg of lizards, the wing and feet of birds, the front flippers and hind flippers of seals, the hands and feet of humans, all have the same location and structure in the early stages of the embryo. Only as the embryos grow do the parts differentiate.

Fourth, most embryos have parts which have no use, neither to the embryo in a womb, nor to the adult form of the embryo after maturity. As with the embryos and the adult forms of fish – which extract oxygen by breathing water – the embryos of mammals, birds, snakes and frogs, have gills

(branchial slits) and loop-like arteries near the gills, even though the adult form of each extract oxygen by breathing air through lungs. According to Darwin, those useless parts are evidence that water breathing organisms preceded air breathing organisms, and the air breathing mechanisms (lungs, nostrils, airways) were constructed from the parts of water breathing organisms.

Fifth, embryos and larvae which are borne into an environment in which they have to provide for their own livelihood (eat, hide) are adapted to their surroundings and resemble their adult form. The embryos of snails, spiders, and fresh water crustaceans are borne with the same but miniature parts as their adult form.

Sixth, some organisms have embryos which are borne more complex, and have more parts, than their adult form. For Darwin, this fact concerning the embryos of parasitic crustaceans and barnacles is evidence for devolution; in which the principles of T/E cause the development of a less complex creature from what was once a more complex creature.

The facts led Darwin to make the very strange claim:

“So again, it is probable, from what we know of the embryos of mammals, birds, fishes, and reptiles, that those animals are the modified descendants of some ancient progenitor, which was furnished in its adult state with branchia, a swim-bladder, four fin like limbs, and a long tail, all fitted for an aquatic life.....Thus, as it seems to me, the leading facts of embryology, which are second to none in importance, are explained on the principle of variations in the many descendants from some one ancient progenitor.....Embryology rises greatly in interest, when we look at the embryo as a picture, more or less obscured, of the progenitor, either in its adult or larval state, of all the members of the same great class.”

(Origin, p. 417-418, 6th)

According to Darwin's T/E, it is likely that the adult form of the early ancestors of Vertebrates looked much like the embryos of current Vertebrates. The variations of that ancestor have evolved into the magpies, rattlesnakes, frogs and people we know today - with the embryos of each individual nearly indistinguishable from another.

As with the facts of geology, geography, and morphology, Darwin claims that many facts of embryology are explained by T/E. The theory explains facts by identifying general principles of

which facts are instances. To explain a fact is to identify the cause of a fact. To identify the cause of a fact is to identify both the states of affairs and the general principles that force the fact to occur.

The hard part of explanation is to determine that the facts are indeed instances of general principles and that those principles are true – that what you say is the cause, really is the cause. This list of facts about embryos played a very significant role in Darwin's long march toward identifying the principles of T/E and providing evidence that those principles are true.

5. Rudimentary Parts

In our everyday lives, we use different parts of our bodies for different functions, with each of these functions necessary to help us get through the day. We use our legs for walking, our fingers for typing, our brains for thinking, and our eyes for seeing where other things are. According to ordinary common sense, we frequently claim that the cause of a part, or the reason for having a part, is the part's function or usefulness. However, many organisms have parts which are either useless or underdeveloped, and yet are still passed on from parent to offspring. In Darwin's examination of innumerable organisms, he expressed an exceptional perspicuity for detail and a relentless curiosity concerning the causes of facts. If the principles of function, usefulness or purpose cause some parts of organisms, then why do these principles not cause other parts? Why do creatures inherit useless parts? These are some of the many facts that caught his attention and forced the question of the role of function and purpose of parts, versus the role of the inheritance and selection of parts:

- Male mammals have nipples and other rudiments of mammary glands
- Snakes have lungs with an unused lobe.
- Some birds have flightless wings (ostrich, kiwi)
- Fetal whales have teeth yet adult whales have no teeth
- Some ruminants (elk, sheep, deer) have offspring that have teeth in their upper jaws, yet these teeth never cut through the gum
- Boa constrictors have a rudimentary pelvis and hind legs in their skeletal structure
- Some beetles have rudimentary wings that are always covered by a hard shell
- Fish that live in caves, and moles that live underground, have undeveloped eyes
- For some organisms in the same class, the same part has different functions (penguins are birds, yet its wings are used as a paddle and rudder, not for flight. Most (all?) fish have air bladders, yet in some fish, the part is used for floatation, and in other fish, it is used for breathing.)

-In some daisies and dandelions, the male floret has a female style.

-Though unseen for many generations, and very rare within certain breeds, some horses are born with stripes on their legs and back.

-Though unseen for many generations, and very rare within certain breeds, some domestic pigeons are born with stripes on their wings.

-Some human babies are born with long tails.

- Human embryos have gills and looping arteries.

As with many of the facts of geology, geography, morphology, and embryology, Darwin claims that some facts concerning rudimentary parts are explained by T/E. A theory explains facts by identifying general principles of which facts are instances. To explain a fact is to identify the states of affairs and general principles that cause a fact to occur.

Darwin presents these many strange facts concerning rudimentary parts and asks, why do these facts occur? Are they part of a divine plan? Are they simply unfathomable? Do they have no causes, no reasons?

"On the view of descent with modification, we may conclude that the existence of organs in a rudimentary, imperfect, and useless condition, or quite aborted, far from presenting a strange difficulty, as they assuredly do on the old doctrine of creation (T/C), might even have been anticipated in accordance with the views here explained (T/E)."

(Origin, p. 423, 6th)

According to Darwin, the principles of T/E not only identify the causes of these strange current facts of rudimentary parts, they will also succeed in making predictions about future parts, and currently undiscovered facts about parts of the ancient past (i.e. fossils). Such predictions provide evidence that the principles of T/E are true.

Summary

Darwin had very specific notions about what counts as a fact, a theory, and an explanation. In this section we examined the "great classes of facts" for which he sought explanation. Each of the facts within the distinct groups of geology, geography, morphology, embryology, and rudimentary parts serves as raw material for his theorization. Facts precede and exist independently of theory.

One of the reasons for Darwin's profound influence was the vast scope and minute detail of his observations. For five years, he sailed around the world and examined the plants and animals of very diverse continents. For seven years, he focused on the most minute distinctions between species of barnacles and published a five volume taxonomy that is still used today.

However, it was his process of theorization and radical conclusions that continue to shake the world. One reason for this profound influence was his use of commonsense theorization that every person around the world uses every day. We frequently answer the question “Why did fact “Y” occur?” by identifying the conditions that force “Y” to occur. To explain a fact is to identify the cause of a fact.

As expressed earlier, two of Darwin’s crucial philosophical assumptions are that reality is structured according to general causal principles, and that these principles are knowable. His process of theorization was the complex task of identifying these general causal principles that force facts to occur. For Darwin, an explanation is a relation between fact and theory such that a fact is made intelligible, understandable, and is accounted for by identifying general causal principles that make the fact necessary. The relation of causation consists of this instantiation of a principle – to explain a fact is to identify the cause of the fact. To take the case a step further, and to apply Darwin's correspondence theory of truth, an explanation is true if and only if the fact is an instance of a principle that is true. Principles are true if and only if they correspond to reality.

What are the principles of T/E? What are the principles of T/C?

Section III:

What are the Theories?

Charles Darwin was not the first person to observe the similarities between organisms, the apparent order of plants and animals, and to speculate that some form of evolution had occurred. His own grandfather, Erasmus Darwin; the Swedish botanist, Carl Linnaeus; the French naturalist, Jean-Baptiste Lamarck; the English specimen collector, Alfred Russell Wallace; all recognized uniform relations between kinds of organisms and wondered how and why those relations occurred. By far, the prevailing explanation of the order of living things and man's place in the universe were the creation stories of the Bible, the Koran, various Hindi texts, and the creation myths of native cultures around the world: at least some creatures were created by some god basically as they appear now.

What distinguished Darwin from all previous thinking anywhere in the world was his identification of specific principles and his huge volume of supporting evidence. He had a remarkable focus on detail and passion for theory. Attention to detail provided facts, and passion for theory fueled a fearless and open-minded search for the causes of facts. His process of theorization was to identify general principles of which facts are instances. The subject of his principles was broad: all creatures, all time, all space on earth; and the purpose of the principles was to isolate and distinguish the causes of these facts. Darwin's burden and accomplishment was to show that his principles are true.

From its inception in early notebooks, he recognized that his theory of evolution was in radical opposition to the prevailing theory of creation, and he didn't make his theory public until he was certain he could demonstrate its truth. When he finally published The Origin of Species, he was confident that he was right and that his proposal could withstand the tidal wave of opposition that he knew would follow.

Theory of Evolution (T/E)

All past and current living organisms on earth have descended from one, or a few, common ancestors according to principles of ordinary generation, inheritance, variation, natural selection and modification.

Theory of Creation (T/C)

Some past and current living organisms on earth were created by god (or gods) according to the principles of supernatural power, sudden change, mysterious cause, and authority.

As explained in Section I, the purpose of a theory is to explain facts, to explain a fact is to identify how/why a fact occurs, and to identify how/why a fact occurs is to identify the cause of a fact. Section II lays out the facts for which Darwin sought an explanation. Both T/E and T/C claim to identify the causes of these facts. In Section III, I will attempt to describe the principles of each theory.

A. Theory of Evolution

The general claim that all organisms have descended from one common ancestor is strange, counter-intuitive and may have remained hidden forever without Darwin's obsession with facts and causation. His great contribution to human understanding was to specifically identify several general causal principles by which the theory operates.

A. Ordinary generation

The principle of ordinary generation states that “Every currently living and formerly living organism is the offspring of a parent.”. This principle traces the history of each organism to the beginning of its identity as an individual. A necessary part of the history of each individual, is that individual's generation from a parent. In the case of asexual reproduction, the parent divides and part of the parent becomes an individual offspring. In the case of sexual reproduction, the individual is formed by the unification of parts from each parent.

Darwin conducted many tests and collected many facts about the reproduction of plants and animals. He challenged the prevailing general principles of his time, that species were created with fixed properties and they remain immutable, by testing the fertilization and cross-fertilization of horses, rabbits, pigeons, wheat, corn, turnips and cabbages. He discovered they gray and indistinct areas between species, between male and female, between single cell and multiple cell organisms, between sexual and asexual reproduction. The facts that some plants and animals contain both male

and female parts and sometimes self-fertilize, and that, as in the case of parthenogenesis, some offspring are produced from unfertilized eggs or seeds, show that the principle of ordinary generation is sometimes bizarre, surprising and not very ordinary. Throughout the plant and animal kingdoms, the details of ordinary generation can be very odd, complex and offspring appear as if by magic.

However, despite its familiarity, variety and complexity, it is impossible to overestimate the importance of this principle to T/E. Regardless of how it occurs, ordinary generation locates both parent and offspring within the matrix of time and space. For all organisms, the parent precedes the offspring in time, and the body of the offspring is constructed from parts of the parent in space. This principle makes necessary that every offspring is caused by a parent, that the parent and offspring are distinct individuals in time and space, and that the offspring be constructed from parts of the parent.

Endless examples of the reproduction of organisms provide evidence for the relation of causal necessity and quantitative identity between parent and offspring. If a claim is made that any particular organism or type of organism is not an offspring of ordinary generation, or did not have a parent that was an instance of this principle, then these competing claims of fact must be tested. It is reasonable to claim that an opponent of a widely supported general principle has the duty to provide evidence that a particular fact is *not* an instance of that principle. However, even without that duty, the main way to resolve the claims of conflicting causes of fact is to identify the cause of the exception. In order to develop evidence, some kind of test must be devised which identifies such a cause.

This is the specific point at which the conflict between T/E and T/C is most clearly revealed. T/E claims that for all time and all space, every living thing is the offspring of a parent, that the parent is a material body located in time and space, that the offspring is a material, physical part of the parent, and that the parent is the cause of the offspring. T/C claims that *not* every living thing is the offspring of a parent, that the parent is not a material body located in time and space, that the offspring is not a material, physical part of the parent and that for some organisms, god is the cause of the organism.

In order to understand these claims, we will further discuss the notions of causation and identity. However, in relation to philosophical assumptions, Darwin maintains that the general principle of ordinary generation is true because it corresponds to reality and that we know it is true through justification. This principle is essential to T/E because it claims to explain specific classes of facts by identifying the cause of these facts. The facts are caused, or made necessary, by being

instances of the general principle. The claims that individual organisms are indeed instances and that the general proposition is true must be justified. These claims are justified by providing evidence.

Darwin did not simply state the principle and assume its truth, he provided evidence by conducting tests, making observations and collecting volumes of data. He developed a huge and diverse body of evidence to justify the claim that every current and past living thing is the offspring of a parent by means of ordinary generation.

“Looking to geographical distribution.....we can see why there should be so striking a parallelism in the distribution of organic beings throughout space, and in their geological succession throughout time; for in both cases the beings have been connected by the bond of ordinary generation.....the relation of organism to organism is the most important of all relations.....”

(Origin, p. 440, 6th)

B. Inheritance

The principle of inheritance claims that “When a parent generates an offspring, some properties of the parent are passed on to the offspring.”.

In order to understand this principle, we need to understand what we mean by the terms “properties” and “passed on.” Properties are facts about objects that include size, shape, color, composition and relations with other objects. If an amoeba is a toothless, single cell organism that constantly changes shape, then “being constructed of only one cell” is a property, “having different perimeters at t^1 and t^2 ” is a property, and “having teeth” is not a property. If the amoeba lived in a bog in Arkansas in 2014, then “living in a bog in Arkansas in 2014” is also a property of that amoeba when it existed in 2014, but disappeared when the amoeba died. Facts about the properties of any living organism remain facts but become past tense when the organism dies.

Properties are the temporal and spatial details of objects and their relations with other objects. If the statement “Johnny is a sheep shearer from Twin Bridges.” is true, then it is assumed that Johnny has the property of “being human”, and it is directly stated that he has the property of being in relationship with other objects called “sheep” such that he shears the wool off sheep, and that he has the property of spending time and having relations with other objects in the spatial area of Twin Bridges, MT. Properties are facts about objects that exist.

What do we mean when we say that some properties are “passed on” from parent to offspring? One thing that we do not mean, one thing that we are claiming to be false, is that those properties that are passed on, either “accidentally occur”, or “randomly occur”. The difference between properties that are passed on, and those that are not passed on, is that the former are caused, forced to occur, or made necessary, and the latter are not caused (or, at least not caused by the same cause), not forced to occur, or not made necessary.

When a human male and human female have sexual intercourse and the female gets pregnant and has a baby, why doesn't the baby look like a butterfly or a pine tree? Is it simply an accident that the baby has a head, lungs, brain, skin, and a curiosity about moving objects? Why does the baby have many of the same properties as the parent? In this principle of inheritance, what we mean by “passed on” is that the offspring must necessarily have certain properties of the parent; or that certain properties are forced upon the offspring; or that the parent somehow causes certain properties of the offspring. This principle requires that the relation of inheritance is a relation of necessity.

What is it that makes the relation between parent and offspring necessary? Darwin's T/E preceded and predicted the discoveries of the field of genetics. He didn't have access to the current facts of DNA, RNA, chromosomes, genes, genetic code nor any of the details of genetic transfer. His microscope wasn't big enough. Although he could see bacteria cells divide and become new individuals, although he could see a sperm fertilize an egg and become a new individual, and he could see the bud of one plant become a separate individual, he couldn't see the bases of a chromosome and their genetic order. However, Darwin conducted many tests and collected many facts about inheritance, and proposed his hypothesis of pangenesis in order to explain how/why properties were “passed on” from parent to offspring.

“Turning now to the laws of inheritance. If we suppose a homogenous gelatinous protozoan to vary and assume a reddish colour, a minute separated particle would naturally, as it grew to full size, retain the same colour; and we should have the simplest form of inheritance. Precisely the same view may be extended to the infinitely numerous and diversified units of which the whole body of one of the higher animals is composed; the separated particles being our gemmules”

(Variation II, p.339)

"An organic being is a microcosm - a little universe, formed of self-propagating organisms, inconceivably minute and numerous as the stars in heaven."

(Variation II, p.347)

As proposed in the principle of ordinary generation, through sexual and asexual reproduction, a part of the parent separates, divides, becomes a part of the offspring. At a specific location in space and time, a part of the parent is numerically identical to a part of the offspring. By collecting a multitude of facts concerning the relationship between parent and offspring, and by attempting to identify the cause of those facts, Darwin's hypothesis of Pangenesis claims that tiny units of matter called gemmules are transferred from parent to offspring. Gemmules are particles that somehow contain much of the information concerning the properties of each part of the parent, and much of the information concerning properties of the parent's ancestors. These gemmules of the parent duplicate to become, and cause, the offspring. According to Darwin's T/E, the principle of inheritance is a relation of both numerical identity and causation such that a material part containing properties of the parent becomes a material part of the offspring, and that this part causes the offspring to have certain properties.

Darwin's great insight into the principle of inheritance was that the relation of identity and causation is true, not only between current parent and offspring, or between grandparent, or great grandparent and offspring; but is also true between current offspring and ancestors of the very ancient past. T/E claims that the principle of inheritance is true, without exception, for all organisms through all space and all time. Whatever the details of how the first particles of dust, elements, and electricity came together on ancient earth and became a living thing, once the first living thing, or few living things, started to duplicate and divide, offspring of all generations have literally shared parts with those original parents. The discoveries of modern genetics indicate that this shared part is a genetic particle, with its genetic structures and laws of genetic transfer. Through his hypothesis of Pangenesis, Darwin recognized that, although much divided and changed, part of that first parent is still somehow part of each current living thing. T/E claims that the principle of inheritance, through numerical identity and causation, necessarily connects current living things with ancestors from a very ancient past.

“...we must believe that a vast number of characters capable of evolution, lie hidden in every organic being...The fertilized germ of one of the higher animals...is perhaps the most wonderful object in nature...we must believe that it is crowded with invisible characters proper to both sexes, to both right and left side of the body, and to a long line of male and female ancestors separated by hundreds or even thousands of generations from present time: and these characters, like those written on paper with invisible ink, lie ready to be evolved whenever the organization is disturbed by certain known and unknown conditions.”

(Variation II, p.30-31)

The principle of inheritance makes necessary that properties of the parent become properties of the offspring. This principle is essential to T/E and is much more physical, literal and ancient than generally understood. We usually talk about inheritance in reference to the appearance of minor surface properties; for example, you have a nose like your father, you developed the same cancer as your mother, or you're quick to anger like your grandfather. These facts are truly remarkable, and are instances of the principle. However, these facts are so current that we fail to see the age and influence of the principle. We fail to see that the same principle has caused the passing of properties from parent to offspring as long as life has existed on earth.

Why is the offspring of human parents another human rather than a mushroom? Why do all organisms mature and get older rather than younger? Why do your children grow by means of cell division? Why do some characteristics lie dormant and invisible for many generations then suddenly appear in an offspring?

According to Darwin, the cause of similarity between parent and offspring is numerical identity, a literal sharing of particles. He didn't know the exact properties of these particles, but, with his hypothesis of Pangenesis, he was close. He speculated that there must be some identifiable, physical entity in the parent that divides, self-propagates, and develops into the offspring. That entity which becomes the offspring must somehow contain the properties, or information, of the parent. But even more strangely, that particle which contains the properties of the parent also contains the properties of very different organisms that thrived on earth millions of years ago. From having four limbs used to paddle submerged in brackish salt water, to having a tail used for hanging from a branch, the principle of inheritance has made necessary that certain particles, and structures of particles, have been “passed on” from common ancestors of a very ancient past. Look at your parents

and look at your children, each instance of ordinary generation from parent to offspring is a test that provides evidence that the principle of inheritance is true. The passing of properties from parent to offspring is made necessary because the offspring is literally a part of the parent.

C. Variation

The principle of variation states that “At each stage in life, every offspring has some properties that are different than properties of its parent.”. While offspring are very similar to their parent in all their parts, each offspring is also slightly different from its parent in each part. Even with single cell organisms, no offspring is exactly similar to its parent. Whether in size, shape, color, composition, location of parts or any other of the characteristics that distinguish one individual from another, each offspring varies slightly from its parent. These differences in properties are called “variations.”

“I shall in this volume treat, as fully as my materials permit, the whole subject of variation under domestication. We may thus hope to obtain some light, little though it may be, on the causes of variability – on the laws which govern it, such as the direct action of climate and food, the effects of use and disuse, and of correlation of growth – and the amount of change to which domestic organisms are liable...Although man does not cause variability and cannot prevent it, he can select, preserve, and accumulate the variations given to him by the hand of nature almost in any way he chooses.

(Variation I, p. 3)

The principles of inheritance and variation both have causal roles in determining the relation between parent and offspring, and the properties of the offspring. Darwin's research and experiments with domestic selection provided many facts which these principles sought to explain. With all of the subjects of his experiments – cows, horses, sheep, wheat, apples, cabbages – the offspring of all plants and animals are similar to the parent in some ways and different in some ways. As described earlier, he proposes the hypothesis of Pangenesis to make intelligible the facts of similarity and dissimilarity.

When the cells of the parent divide, as in asexual reproduction, or unite, as in sexual reproduction, the part of the parent that develops into the offspring contains “gemmules” or self-duplicating units of matter containing the information of the parent. With pangenesis, Darwin

proposed that “the number, vigour, or affinity of the gemmules” (Variation II, p.332) affected both the similarity and dissimilarity between parent and offspring. While the details of the properties and relations of these units of matter and information remained a mystery in his lifetime, his many facts of domestic selection provided evidence that some variations are caused by a dynamic combination of conditions of life (food, climate, availability of mates, etc.) and laws of development (use and disuse of parts, changing one part of the body affects other parts).

However, these experiments also showed that even offspring of multiple births – peas in a pea pod or puppies in a litter – often if not always, differ in constitution, not only from the parent, but also from each other. Darwin's observations led him to propose a principle of variation which maintains that some causal relation in the process of ordinary generation makes necessary the slight differences in constitution between parent and offspring, and between offspring and offspring.

D. Natural Selection

The principle of natural selection states that “Variations which benefit the survival and reproduction of individual organisms will be preserved, and variations which injure the survival and reproduction of individual organisms will be destroyed.”

“This preservation of favourable variations and rejection of injurious variations, I call Natural Selection. Variations neither useful nor injurious would not be affected by natural selection, and would be left a fluctuating element...”

(Origin , p. 94, 1st)

Natural selection is the principle of T/E for which Darwin is most famous and most maligned. He discovered this mechanism of selection through observations of farmers and gardeners in rural England. As part of its explanatory role in T/E, the word “selection” is used in analogy with the process of a farmer choosing the properties she seeks to develop in her agricultural product. If a farmer raises sheep and sells wool as part of her annual income, and if fine wool is worth more money than coarse wool, then she will likely select a fine wool ram to breed with a fine wool ewe to product a lamb with fine wool. By analogy, Darwin expands this process of the domestic selection of certain properties of the plants and animals used in agricultural production and applies a similar causal relation to all living organisms since the beginning of life on earth.

However, it's important to keep in mind that the relation between domestic selection and natural selection is only an analogy. Darwin was well aware of the limits of analogy and went to considerable length to show where the analogy fails. Whereas with "domestic selection", the farmer makes a conscious choice and acts in such a way as to cause the development of certain properties, with "natural selection", there is no agent making decisions about the properties of offspring. There is no conscious choice by Mother Nature, nor some Deity, nor karma, nor any other spiritual force which determines how organisms vary and succeed. Natural selection is not pre-ordination and has no plan, nor overarching purpose, nor goal, nor design.

Natural selection follows variation. The instances of variation precede instances of natural selection in time, thus natural selection does not cause nor induce variations. Natural selection is the very complex set of causal relations between an individual and its conditions of life such that certain properties of the offspring contribute to the survival and reproduction of that individual. Natural selection is a process, or mechanism, by which properties of an organism interact with conditions of its environment, and if these properties help determine that the individual live and reproduce, then these properties are "selected" and will eventually become established. An individual organism is born with variations, then natural selection just happens.

Darwin was much influenced by Thomas Malthus' Essay on the Principle of Population which examines the rate of population growth of various species and identifies the fact that every parent of any plant or animal produces more offspring than can survive and reproduce. If all offspring of any plant or animal were allowed to survive or reproduce, eventually, that group or species would overpopulate and consume all the resources that group needs for survival. If any group of plant or animal is to survive, some offspring must live and some must die.

This lesson is adopted into T/E; since all offspring vary slightly from each other, and since some of those variations are heritable, and since some of those variation are beneficial to survival, those offspring with beneficial variations are more likely to survive and pass their properties to further offspring. This causal mechanism, natural selection, is a complex combination of organism and circumstance, that partially determines which offspring will live and which will die.

“Let it also be borne in mind how infinitely complex and close fitting are the mutual relations of all organic beings to each other and to their physical conditions of life; and consequently what infinitely

varied diversities of structure might be of use to each being under changing conditions of life.”

(Origin, p 87, 6th)

The principles of T/E are as complex and interwoven as the “infinitely varied diversities of structure” of plants and animals in the natural world. Two common events concerning ancient and current organisms were prominent subjects of Darwin's search for explanation. Instances of migration and extinction served as the primary facts leading to his discovery of the principle of natural selection.

Most plants and animals move around. Some large carnivores, like wolves and mountain lions, are territorial and spend their lives within an area that provides prey, mates and habitat. However, if the habitat is limited and a dominant male lays claim to a territory, the young males of a family borne to that territory must either defeat the current ruler or find a new territory. Young offspring are forced to branch out and migrate to find new habitat. As these offspring struggle to eat and find mates, their slight variation in the sharpness of claw or keenness of stealth increase the probability of their success or failure. The principle of natural selection claims that if these variations give advantage to establishing a territory, and if these variations are heritable, then the offspring of the new ruler of a territory will inherit sharp claws and keen stealth, and will eventually prevail, expand into their own territory and further disperse these properties.

Although rooted in place during their adult life, as seeds, most plants migrate far and wide. Whether eaten and passed through the digestive system of birds, hooked into the fur of a coyote, or launched hundreds of miles in streams of wind, the many offspring of a plant enter new territory and propagate. If each seed varies in its resistance to frost or depth of root, and as each seeds struggles to live in its new location, if these variations help the offspring survive, and if the variations are passed on to the next generation, then a parent will have expanded its territory and will promote future expansion.

Plants and animals which are transported from their native habitats in Europe and Asia to land and water in North America are good examples of natural selection through migration. If the individuals are introduced into a habitat with favorable growing conditions and few enemies, they are likely to dominate and spread quickly through the region. In the plant world, leafy spurge and Russian knapweed have become dominant invasive species that crowd out the native plants. In the animal world, Burmese pythons in Florida and Chinese jumping carp in Mississippi will destroy and

replace local populations of fish, reptiles and small mammals. Even in one person's short lifespan, instances of migration are measurable, predictable and irreversible. Migration is evidence for the truth of the principle of natural selection.

The extinction of various kinds of plants and animals is another common event which provides strong evidence for the principle of natural selection and for T/E.

“Natural selection acts solely through the preservation of variations in some way advantageous which consequently endure. Owing to the high geometrical rate of increase of all organic beings, each area is already fully stocked with inhabitants and it follows from this, that as the favored forms increase in number, so generally, will the less favored decrease and become rare. Rarity, as geology tells us, is the precursor to extinction.”

(Origin, p.100, 6th)

Extinction occurs when every individual within a group that is identified by the natural order of classification dies, and the group disappears. The subject of extinction is not the death of individuals, but the death of groups of individuals. A die-off can occur in several ways; a catastrophic change of conditions of life (a meteor hits earth and causes a cloud of dust which hides the sun for many years), the invasion of another species that destroy all the individuals (European settlers kill all the buffalo in the American west) or the offspring of a parent species develop heritable variations that give advantage over the parent and the parent species is exterminated. The principle of natural selection is a cause of both success and failure in each of these cases of extinction. The main point being that, in all cases of extinction, the relation of ordinary generation between parent and offspring occurs less and less frequently, causing fewer and fewer offspring until there are no more offspring. Extinction occurs when the relation of ordinary generation stops. With no offspring, eventually all the individual members of the group die and the group becomes extinct.

The study of geology presents many ancient examples of both migration and extinction. Some fossils are the remains of individuals which were members of groups that no longer exist. In the ancient past, some early groups migrated to all corners of the earth and eventually show up as fossils far from their region of origin.

However, we don't have to look to the ancient past to find examples of migration and extinction. The spread of noxious weeds, and the passage and enforcement of the Endangered Species

Act, are current instances of the principle of natural selection. The many cases of human attempts to eradicate or preserve groups of the natural world are strong evidence that the principle of natural selection is true, and that it does explain why certain facts occur.

While Darwin devoted much focus toward showing that migration and extinction are instances of natural selection, he also argued that another fact concerning this principle is essential evidence against T/C.

“On our theory the continued existence of lowly organisms offers no difficulty; for natural selection, or survival of the fittest, does not necessarily include progressive development – it only takes advantage of such variations as arise and are beneficial to each creature under its complex relations of life.”

(Origin, p 124, 6th)

Through billions of years and millions of generations, life on earth has grown in complexity and diversity. Many forms of plants and animals have increased their number and efficiency of parts. The organs of sensation, intelligence and reproduction have commonly become more specialized and closely fitted into the unbelievably intricate conditions of earth's environment. Many proponents of T/C have maintained that this progression from simplicity to complexity is evidence of a divine or cosmic plan and that progress toward perfection is a necessary effect of special causation.

Darwin argued that natural selection does not entail progress by providing counter examples; some simple organisms have thrived in extreme conditions (heat, pressure, oxygen deprivation) unchanged since the dawn of life; isolated populations of ancient creatures (marsupial, lancelet) exist unchanged in specific conditions around the world; for many animals that mature in stages (metamorphosis), the parts of the larvae are more specialized and complex than the adult form (retrogression). Whereas the principle of natural selection causes some properties of offspring to prevail and other properties to fail, and while frequently the properties that succeed add complexity and efficiency to the surviving species, it is sometimes the case that less complex and less specialized properties will cause survival, and thus be selected. The notion of progress toward perfection, and the notion of a divine plan, were huge issues in Darwin's time, and continue to influence the argument between T/E and T/C. With his principle of natural selection, Darwin clearly argued that progress,

whether by increased complexity, intelligence, adaptability or any other metric, is neither required nor implied by T/E.

(E). Modification

The principle of modification states that "Some variations gradually become established.". Modifications are changes in properties between ancestor and offspring which develop gradually over multiple generations and become fixed. Once fixed, those changes are passed on to future generations through inheritance.

The principles of ordinary generation, variation, inheritance and natural selection are assumed and built into the principle of modification. Through this combination of causal relations, the principle of modification makes necessary that some parts of some organisms change through time. These changes to parts vary greatly in degree and in the amount of time they take to become established. Some modifications are so slight as to be nearly unnoticeable (pattern on the shell of a sand dollar), others so extreme as to be nearly unfathomable (from branchae of ancient sea creatures to the lung of a man). The principle of modification causes some selected, heritable variations to become established in parents and passed on to future offspring.

While most instances of modification are introduced by the variation of offspring in the linear chain of descent (parent to offspring, to grand-offspring, to great-grand-offspring, and so on) and then gradually established, modern molecular phylogenetics has shown that some instances of modification also occur by means of horizontal gene transfer and infectious heredity. The parent organism is invaded by, or absorbs, a separate organism, and the invader (suddenly) becomes part of the parent. The parent is thus changed, and then passes these changes onto its offspring (See The Tangled Tree, by David Quammen).

I don't believe that these kinds of (sudden) changes are counter-examples to Darwin's T/E. These processes can be considered "conditions of life" that affect the parent and are not in conflict with Darwin's heavy reliance on parent-to-offspring inheritance. Whether by genetic mutation, horizontal gene transfer, infectious heredity, or some other process yet to be discovered, the changes to the parent are caused by "conditions of life", and then, upon reproduction, the parent becomes an instance of the principles of T/E. However the changes to the form and identity of the parent occur, the principle of modification requires that some changes are selected, become established, and are passed on to offspring.

It's important to keep in mind that, although some instances of this principle are very long lasting and seemingly permanent, many modifications are themselves subject to modification. Some modified parts last a long time, yet, eventually and gradually change. Darwin frequently used the term “plastic” to refer to this process of modification.

“Breeders habitually speak of an animal's organization as something plastic, which they can model almost as they please.”

(Origin, p.48, 6th)

“...the organization seems to become plastic, and we have much fluctuating variability... the nature of the organism is such that it yields readily, when subjected to certain conditions, and all, or nearly all the individuals become modified in the same way.”

(Origin, p.131, 6th)

Whereas the modification that occurs in the process of domestic selection is rapid and familiar, the modification implied by Darwin's T/E is frequently so gradual as to be unrecognizable. Modification implies that life on earth is very old and that every complex organism of today is the descendant of ancient organisms that had very different parts.

The principle of modification is a causal relation between many instances of parent and offspring which makes necessary that one kind of creature literally becomes another kind of creature, which becomes another kind of creature. While this sounds like magic or miracle, the reason modification is not supernatural or mystical is that, according to Darwin's T/E, every instance of the principle is a material body that is identifiable and located in time and space.

“On the principle of multiplication and gradual divergence of character (modification) of the species descended from a common parent, together with their retention by inheritance of some characters in common, we can understand the excessively complex and radiating affinities by which all the members of the same family or higher group are connected together.....if every form which has ever lived on this earth were suddenly to reappear, though it would be quite impossible to give definitions by which each group could be distinguished from other groups, as all would blend

together by steps as fine as those between the finest existing varieties, nevertheless a natural classification, or at least a natural arrangement would be possible.”

(Origin, p 453-456, 6th)

This comprehensive thought experiment makes claims about every current living thing on earth, without exception: every individual of every group of the natural order is descended from a previous group of individuals of the natural order. Whatever complex set of properties define members of one group of the natural order, those individuals descended by means of ordinary generation from previous individuals that were members of a different group. The principle of modification explains how groups descend from groups by gradual changes of properties between parent and offspring, and how every group must fit within the structural framework of descent.

The publication of the first edition of the Origin of Species in 1859 created a firestorm of opposition to Darwin's principle of modification. In the 6th edition of 1872, Darwin added a full chapter (Chapter VII, “Miscellaneous Objections to the Theory of Natural Selection”) in which he provided counter arguments to his critics. This chapter goes to the heart of the conflict between T/E and T/C and addresses incompatibilities between the two theories which are unresolved to this day.

The proponents of T/C made, and continue to make, these arguments:

First;

“Natural selection is incompetent to account for the incipient steps of useful structures.”

(Origin, p.222, 6th)

Second;

“It has often been asked, if natural selection be so potent, why has not this or that structure been gained by certain species, to which it would apparently have been advantageous?”

(Origin, p. 223, 6th)

Third;

“Mr. Mivert is inclined to believe, and some naturalists agree with him, that new species manifest themselves 'with suddenness and by modifications appearing at once.'”

(Origin, p. 224, 6th)

Darwin counters the first argument by giving multiple examples of slight changes to various organisms that obviously give advantage in survival (the long neck and legs of the giraffe, the baleen of the whale, the coloration of insects, the location of the eye in a flatfish). He then gives examples of

changes which are so slight and hidden that we are ignorant of their effect or usefulness in survival (development of pincers in crustaceans from an organ used strictly for locomotion, development of climbing plants from parts that are sensitive to light and gravity). He then introduces a principle of rationality that permeates all of his writing:

- 1) if “x caused y” is true
- 2) if “y = z”
- 3) then “x caused z” is true

In this view of rationality, 'x' is the principle of modification, 'y' is a specific part of a specific organism, and 'z' is a different, yet similar, part of a different organism. Darwin uses this form of argument to defend his general conclusion that the principle of modification causes changes in all parts of all organisms.

What made Darwin particularly effective in his defense of T/E was his use of observations, tests, and predictions as evidence to show that 1) and 2) are true. He begins the observations and tests on a wide range of domestic plants and animals, and formulates general propositions of which individual members of each group are instances. For example, experiments on pigeons and sheep showed that properties such as the coloration of feather and fineness of wool could be selected and established. After showing that the principle of modification causes changes to certain parts of domestic plants and animals, he expands his experiments and makes claims about the same parts of plants and animals in nature. He argues that if the structure and organs of domestic organisms are modified by certain principles, then the same parts of the natural world are modified by the same principles.

Consequently, if the variation of slightly longer neck and legs gave advantage to the giraffe by giving access to more food and better health, and if the variation is heritable, then that property would be passed on and become established in all future offspring. Darwin uses this exact argument “if variation, if inheritance, if selection, then modification” to show that slight gradation does in fact cause the development of some parts of some organisms. He then expands the argument to examine other parts of other organisms: if observations, tests and predictions identify a general causal principle in some cases, then, unless there are true counter-examples, that principle is true in all cases. He concludes that even extremely slight and unnoticeable gradations cause changes in the parts of all organisms.

This principle of rationality permeates all of Darwin's T/E “if true in one case, if true in many cases, then true in all cases.” He uses this principle of rationality to shift the burden of proof: when observations, tests and predictions justify a general principle in many cases, then the opponent of the principle must carry the burden and show that the principle is not true. Darwin's move from “some” to “all” is particularly evident in his analysis of the modification of the parts of living things. He was clearly committed to the claim that any part of any organism was developed by slight gradations through long periods of time.

“To suppose that the eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest possible degree. Yet reason tells me, that if numerous gradations from a perfect complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown exist; if further, the eye does vary ever so slightly, and the variations be inherited, which is certainly the case; and if any variation or modification in the organ be ever useful to an animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable by our imagination, can hardly be considered real.”

(Origin, p.189, 1st)

With painstaking detail, Darwin examines the organs of sensitivity to light in simple creatures (crustacean, mollusk), then examines the same organs in more complex creatures, and shows many of the slight modifications between simple and complex. He then examines the slight gradations between the other organs of sensation; digestion, respiration, reproduction and more, and concludes:

“If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down. But I can find no such case.”

(Origin, p.191, 1st)

The facts of slight gradation between the same part of very different creatures (eye of a crayfish to the eye of an eagle, flipper of a seal to the hand of a man) are both evidence for the truth of the principle of modification and explained by this principle. Darwin provides evidence for truth by comparing facts (comparing differences between the eyes of fish which live inside a cave to the eyes of fish which live outside a cave), conducting tests (viability of various plant seeds in salt water), and making predictions (fossils discovered in younger geological strata will be more similar to current organisms than fossils discovered in older strata).

As evidence is collected, and the truth of a principle becomes more likely, and finally that the truth of the principle is established, then that principle explains other independent facts. To explain a fact is to show that the fact is an instance of a general proposition that is true. The principle of modification is a relation between facts such that one set of facts makes another separate set of facts necessary. This necessary relation between facts is causation, and the principle explains facts by identifying the cause of facts.

Darwin's second argument in Chapter VII supports the claim that organisms are gradually modified through time by examining the crucial fact that the parts and properties of any offspring are limited to the parts and properties of its parent(s). The parts of the parent, and only these parts, are passed on to the offspring. To use Darwin's architectural metaphor, the offspring is built upon, and made from, parts of the parent.

An offspring becomes an individual only by means of parent cell division or parent fertilization. Although, through the principle of variation, each offspring is slightly different than its parent, the offspring can develop only those parts which are handed to it by ordinary generation. The relation between parts of the offspring and parts of the parent is one, not only of causal necessity, but also of numerical identity. Some part of the offspring is numerically identical to some part of the parent.

Darwin claims that the fact of very different organisms having very similar parts is sometimes evidence that these organisms have a common parent, and consequently share a numerically identical particle. He makes a careful distinction between parts that are related through genealogy (homologous organs: e.g. swim bladder of a fish and lungs of a man) and parts that are related by use or function (analogous organs: e.g. wings of a bird, wings of a bat and wings of a fish). Whereas homologous parts do provide evidence for the principle of modification, analogous parts do not

provide such evidence. Whether similar parts of different organisms are homologous or analogous requires further examination of other parts of the creatures in question, for example, the flippers of a seal and the fins of a fish are similar in function and shape, but the skeleton, and the organs of respiration and reproduction, show that fins and flippers are analogous, not homologous. The important claim concerning homologous parts is that the similarity of these parts is caused by the sharing of an ancestor. This sharing of an ancestor causes similarity because that ancestor literally divided and shared matter and the structure of matter with its descendants. Sometimes similarity is evidence that the chain of descent is unbroken.

Two other kinds of facts also provide evidence for Darwin's claim that the parts and properties of the offspring are limited to only the parts and properties of the parent: rudiments and reversions. Rudiments (Darwin also called these parts 'remnants' or 'vestigial') are shriveled or partial organs that, in current organisms, have little use or function, yet in ancient organisms had significant use or function. Although of little current use, those organs are shared with very different kinds of creatures. For example, the tailbone of a human baby is the rudiment of a part that is shared with nearly all birds, fish, reptiles, amphibians and other mammals. In our ancient parents, the tail was essential for locomotion through water. Also, the gills or branchia of a human embryo are rudiments of distant parents that breathed water. Also, the prostate and mammary glands of human males are remnants of our ancient parents which were both male and female, a time when our parents reproduced asexually. Rudiments are evidence that an offspring is literally constructed from parts of its parent.

Reversions are certain parts which lie dormant and invisible through tens, thousands or millions of generations but then suddenly appear in a current offspring. This part which suddenly reappears had been common to a specific group of organisms in the distant past, but had disappeared through time.

“That a being should be born resembling in certain characters an ancestor removed by two or three and in some cases by hundreds or even thousands of generations, is assuredly a wonderful fact. In these cases the child is commonly said to inherit such characters directly from its grandparent, or more remote ancestors. But this view is hardly conceivable. If, however, we suppose that *every character is derived exclusively from the father or mother*, but that many characters lie latent or dormant in both parents during a long succession of generations, the foregoing facts are intelligible.”

Darwin observed and tested many kinds of domestic plants and animals and gave multiple examples of the appearance, in current domestic organisms, of properties from their ancient wild ancestors. From the size and texture of wheat seeds, to the black bars on wings of pigeons, to the thick hair on the backs of some human males, the reappearance of ancient characters greatly influenced his formulation of the principle of modification as an explanation of facts.

Darwin countered his critics second argument against modification by presenting many instances of homologous organs, rudiments and reversions. These facts, he claims, show that the parts and properties of an offspring are limited to the parts and properties of the parent. Organisms do change and are modified through time, however, only parts that already exist can be modified. Each offspring is a modified form of its parent, and the cause of similarity between an offspring and its parent, grandparent and ancient ancestor, is the literal sharing of material particles between each generation.

This leads us to Darwin's third argument in support of the principle of modification. His critics maintained that “new species manifest themselves with suddenness and by modifications appearing at once.” (Origin, p. 224, 6th) They claim that some individuals or groups of individuals appeared suddenly and fully formed along the timeline of the history of the earth, and that these individuals were created at specific points in time out of nothing, or out of very different kinds of materials.

The critics of the principle of modification claim to make true statements and claim to provide evidence for their principle of sudden change. Their primary sources of evidence are, first, religious texts (Bible, Koran, church doctrine) and cultural stories (creation myths, oral tradition) and, second, wide gaps in the fossil record.

In Chapter VII of the Origin, Darwin proposed five arguments against his critics' principle of sudden change:

1. He challenged the authority of religious texts by claiming that the conditions of truth remain constant through time. The statement “x caused y at t” is true if and only if x caused y at t, regardless of when the statement was written or spoken. The authors of any ancient text, and the past proponent of any claim to a relation of correspondence between propositions and reality, are held to

the same conditions of truth as are current proponents of such correspondence. No matter who said it or when, time doesn't change the conditions of truth. The authors of texts and the tellers of creation stories make statements about the causation of facts, and what makes these statements true is that the statements correspond to reality.

Regardless of when the books of the Bible, Talmud, or Koran were written, or when the creation stories were spoken, all the authors and speakers make specific claims about the causation of facts. They all make claims that “x caused y” is true. If we can agree that fact 'y' really happened - be it flood, the removal of a large stone from the entrance to a tomb, or the birth of a human baby - then all former authors are in the same boat and can be held to account by the same criteria of truth. They all claim to identify “x”, and claim a relation of causation between “x” and “y”.

In addressing Darwin's sets of facts, the dispute and incompatibility between Darwin and the proponents of sudden change is with the identity of “x” and the relation of causation between "x" and "y". Darwin says it's one thing, the proponents of T/C say it's something else. It's a deep and profound disagreement about the identity of “x” and whether "x" really is the cause of fact "y".

The proponents of sudden change cite ancient texts and stories as evidence for their claims about causation. In this argument against his critics, Darwin claims that these texts cannot simply be assumed to be true. In order to serve as evidence, they must also be shown to be true. No matter when the Book of Genesis, the Koran or any canon of church doctrine were written, no matter when the tribal elders spoke their creation stories, the authors were human beings that used language to make claims about causation. Although the body of knowledge is greatly expanded since those early times, the authors were subject to the same criteria of truth and burden of proof as current proponents of sudden change. Whether prophet, disciple or wise elder; saying doesn't make it so – claims to causation must be justified.

In relation to claims to causation, religious texts, cultural stories and Darwin's T/E, all share universality; they each claim to be true for all persons and all creatures through all time. They each provide principles with which to explain certain facts. Different religions, different creation stories and the principles of T/E make incompatible claims about causation; some say "It is the case that x caused y” and some say “It is not the case that x caused y.” If the laws of propositional logic obtain, they can't all be right. Even the proponents of sudden change disagree with each other and make incompatible claims.

Darwin's response to the critics of his principle of modification was to provide many examples of organisms that are instances of his principles of T/E. He sought to show that even the authors and subjects of the Bible, Koran and creation myths were themselves instances of those principles. He claimed that human beings, with their nerves, brains, muscles and capacity for language, are not specially created, but rather, are instances in a very old chain of life. Through observation, tests and predictions, Darwin shouldered the burden of proof and sought to identify the causes of certain facts about human beings, and to justify those claims to causation. He justified these claims by providing evidence that the principles of T/E are true.

2. In his second argument against the proponents of sudden change, he again challenges their evidence. T/C maintains that gaps in the fossil record show that some types of organisms appeared suddenly and fully formed. Darwin agreed that the fossil record is very incomplete and that fossil remains reveal a world vastly different than the current age. However, he used these same facts for just the opposite conclusions.

Organic matter is notoriously difficult to preserve. Wind, sun, water, birds, bugs, and oxygen all work to disintegrate and recycle the parts of every organism. Darwin argued that the conditions of preservation, the protection from the elements, are extremely rare and eons are likely to pass without preserving specimens of the time. Thus, wide gaps in the fossil record are to be expected. If remains are preserved, they must remain underground and hard to find. He integrated his understanding of living things with facts from geology; the earth is in constant flux with massive plates of rock and soil separating, drifting, rising and falling, in and out of great oceans. The exact record of life in earth is hidden and broken.

Rather than relying on mysterious causes, Darwin fully accepts the strange and rare facts of the fossil record. He examines how migration and extinction affect where fossils are found, and how earlier and later fossils relate to each other. With migration, it is to be expected that, as populations of any particular species increase, their territory will expand into places they had not been before. Hence as new organisms move into a territory, their fossilized remains will suddenly appear amongst the other creatures of that time and space. With extinction, as groups of invaders compete with, and defeat existing populations, or if other conditions of life change and prevent the success of an existing group, the fossil remains of that group will suddenly disappear and never show up again.

“By the theory of natural selection all living species have been connected with the parent-species of each genus, by differences not greater than we see between the natural and domestic varieties of the same species at the present day; and these parent-species, now generally extinct, have in their turn been similarly connected with more ancient forms; and so on backwards, always converging to the common ancestor of each great class. So that the number of intermediate and transitional links, between all living and extinct species, must have been inconceivably great. But assuredly, if this theory be true, such have lived upon the earth.”

(Origin, p. 288-289, 6th)

Darwin predicted “missing links” in the chain of life. T/E claims that all current organisms are descendants of earlier organisms, and consequently, that between any current individual and the fossilized remains of its ancient ancestor, and between any younger fossil and an older fossil of its even more ancient ancestor, there existed individuals of intermediate form.

By “form,” Darwin means a set of properties which are the criteria, or necessary and sufficient conditions, for belonging to a set. Although there are difficulties in classification and grey areas between forms (Is x a frog or a toad?), all organisms have properties which allow comparison with other individuals and the consequent classification into 'forms'. Darwin's great claim is that the similarity between certain living organisms and certain fossils, and between younger fossils and older fossils, is genealogical. He claimed that the cause of similarity, the cause of having some of the same properties, is the numerical identity of parts. This claim guarantees, makes necessary and entails, that between any current individual and the fossil of its ancestor there existed intermediate forms. The numerical identity of parts between an older form and a younger form makes necessary the existence of the intermediate forms.

In 1859, Darwin made grand predictions concerning the future discovery of missing links. The logical grounds for this prediction were, and are, the numerical identity of parts between parent and offspring. Although the geological record is still vastly incomplete, the discovery and identification of fossils has provided evidence which confirms the principle of modification and disconfirms the principle of sudden change.

Both the proponents of T/E, and many of the proponents of T/C, agree that strange and dissociated creatures once roamed the earth. They also agree that human beings are complex, moral and spiritual creatures. The changes between those ancient creatures and current living humans

appear to have happened suddenly, but they didn't. The ongoing discoveries of missing links is evidence that T/E does identify the cause of facts, while the same discoveries show that T/C does not identify the cause of facts.

3. Darwin's third argument against sudden change points out the need for many breeding pairs in order to establish and maintain a viable population of any particular species. When there are too few breeding pairs, the interbreeding of family members causes fewer and weaker offspring. The proponents of sudden change are forced to maintain that, with each type of creature, not only were one male and one female created, but that tens or hundreds of thousands of pairs, each with slightly different parts, were created at the same time and in the same space.

4. In Darwin's fourth argument against sudden change, the proponents of sudden change claim the sudden appearance of creatures with specific parts that gave them dominion over certain habitats of the earth; for example, that birds were created with wings to fly, fish were created with fins to swim, or humans created with intelligence and a moral faculty to do god's will, and to worship god. But Darwin argues that the parts of creatures that serve specific functions are no more able to appear suddenly than any of the other parts of the whole creature. Each part of any creature is related to all other parts by laws of use and disuse and laws of correlation of growth; wings work only if the muscles and skeleton comply; fins work only if the nerves and body shape comply, intelligence and religious experience occur only if the heart and blood vessels are large enough to provide oxygen to the brain. All the different systems of each organism depend on each other, and changes in one organ cause changes in another organ. The proponents of sudden change are wrong in claiming that any one part of any creature appeared suddenly.

5. Darwin's fifth argument against sudden change focuses on embryos:

“It is notorious that the wings of birds and bats, and the legs of horses and other quadrupeds, are undistinguishable at an early embryonic period and that they become differentiated by insensibly fine steps. Embryological resemblances can be accounted for.....by the progenitors of our existing species having varied after early youth, and having transported their newly acquired characters to their offspring, at a corresponding age. The embryo is thus left almost unaffected, and serves as a record of the past condition of the species.....It is incredible that an animal should have undergone such momentous and abrupt transformations, as those above indicated (e.g. sudden appearance of wings on

birds and bats, sudden change from a hippo to a horse); and yet should not bear even a trace in its embryonic condition of any sudden modification.”

(Origin, p. 227, 6th)

These facts about embryos; that all embryos of all classes of vertebrates have very similar structure and location of parts; that the properties which distinguish the classes develop gradually between conception and birth; that the rate of maturity from conception to birth, and again from birth to old age, of the offspring corresponds to the rate of maturity of the parent; greatly influenced Darwin's theory. This similarity of embryos was a crucial and fundamental piece of evidence that, he believed, justified some sweeping claims about life on earth.

The similarity of embryos helps identify causal relations that make facts necessary. The reason the embryo of a dog and embryo of a human are similar is that they descended from a common ancestor, and consequently, share a part of that common ancestor. Present embryos of the same class are necessarily connected to the very ancient past by single acts of ordinary generation forming an unfathomably long chain of individual parent/offspring relations. Whether by union of sperm and egg, or by division of an unfertilized egg (parthenogenesis), or by cell division of single cell organisms; the fact that the offspring is literally a part of the parent is the cause of the similarity of parent and offspring. Darwin's sweeping claim is that over multitudes of generations, this sharing of a material part is the cause of the similarity of embryos of different species whose adult parents have very different forms.

This part that is shared by individual embryos of separate species is minute, old and has divided or somehow replicated itself innumerable times. According to Darwin's theory of pangenesis, the part that is shared by parent and offspring is a physical particle that is identifiable by its location in time and space. This particle contains information of each parent and has been modified during its many instances of ordinary generation. His method of determining which parts are shared between current embryos of different groups is to trace the genealogy of each embryo of each group backward through time to the point at which they shared a common set of parents. That set of parents starts the divergence, and some part of that original set is passed on through time and space according to the principles of T/E.

Perhaps the field of genetics has identified that part which has been divided and shared so many times since the beginning of life on earth. Darwin didn't know what that part consisted of. With

his theory of pangenesis, he speculated that it is a 'gemmule', and he wasn't far off. Philosophically, what's important is that, whatever the final properties of that thing which has been passed on between the innumerable instances of the parent/offspring relation, it is a physical object which is identifiable at the time, and in the space, of each instance of the relation.

Each current living thing has been separated from the first instances of cell division by billions of years. Each human being is separated from the early members of the vertebrate phylum by hundreds of millions of years. Yet, according to Darwin's T/E, each instance of the parent/offspring relation between current humans and their very distant set of relatives certainly did occur, and continues to occur. Darwin argues that, in each instance along the long chain of descent, every individual is an offspring of a parent, and each offspring consists of a part of the parent. That part which is passed from parent to offspring explains, or causes, the similarity between parent and offspring.

It was Darwin's sweeping claim that the similarity of embryos of very different species is also explained by, or caused by, the sharing of parts. The search for the shared part is genealogical and leads backward through time, past each instance of ordinary generation, to the point of divergence, a set of common parents. According to the principle of modification, that shared part has been gradually modified through millions of years and millions of generations. However, the similarity of embryos of different species is evidence that the identical part from common parents is still with us today. Darwin maintained that the study of embryos provides a great deal of evidence, both for the principle of modification, and against the principle of sudden change. Citing many examples of the shared parts between all human embryos and all embryos of the other classes of vertebrates, he concludes that, if humans had been suddenly created or gone through sudden change, then that difference or change would be evidenced in its embryo. However, the opposite is the case, the characteristics between embryos are overwhelmingly similar and can be explained only by the sharing of a part that is gradually modified. That part which is gradually modified is passed on through generations only by means of the parent/offspring relation. Consequently, according to Darwin, the sharing of a part can be explained only by descent from a common ancestor. No organism appeared suddenly.

In Chapter VII of the 6th Edition of the Origin of Species, Darwin responds to his critics with arguments that still resonate today. His three arguments in support of the principle of modification; that some creatures do in fact have parts that give advantage to survival; that parts of the offspring are

limited to only parts of the parent; and that no organism has ever appeared suddenly; provide strong evidence that the principle of modification is true. The arguments of T/C; that some scriptures and stories are necessarily true messages from god; and that gaps in the fossil record show sudden creation, provide scant evidence against modification.

I have summarized my understanding of the five principles of Darwin's T/E. As mentioned at the beginning of section III, Darwin was not the first person to recognize the similarities between groups of organisms, and to speculate upon the causes of this order. What makes his T/E so profound was that his identification and justification of principles was so thorough and complete. His method of theorization was straightforward, public and vulnerable; he formulated general principles about the causes of facts and provided evidence to show that the principles are true. With quiet but rigid confidence, he claimed that his principles of ordinary generation, inheritance, variation, natural selection and modification explained many facts about life on earth.

There can be no doubt that Darwin proposed T/E in opposition to T/C, the prevailing theory of his day. In order to evaluate the success of his proposal, we need to further clarify his understanding of T/C.

B. Theory of Creation

Christianity

"And God said: "Let us make man in our image, after our likeness; and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over the earth, and over every creeping thing that creepeth upon the earth."

Holy Bible, Genesis 1:26

Islam

"Recall when your Lord said to the angels: 'I will indeed bring into being a human being out of dry ringed clay wrought from black mud. When I have completed shaping him and breathed life into him of My Spirit, then you fall down before him in prostration.

So, the angels – all of them – fell down in prostration."

Qur 'an 15: 28-30

Hinduism

"Thus, indeed, he produced everything that exists in pairs, down to the ants. He (Viraj) realized: 'Indeed, I am the creation, for I produced all this'"

Brihadaranyaka Upanishad

1.4. 4-5

T/C takes many forms, has many names, and is hard to define. It's a part of most, if not all, religions and cultural creation myths. Undoubtedly, some proponents of T/C will object to any formulation and claim that their god cannot be categorized and is somehow beyond human judgment. However, this is a discussion about truth and we are trying to determine who's right and who's wrong in some of the big questions of our lives. To refuse to participate is evidence against T/C, not for it.

Darwin himself was not naive about religion. As a child and young man, he was a devout Christian. He received a degree in theology from the University of Cambridge and seriously considered the life of an Anglican clergyman.

"I did not then in the least doubt the strict and literal truth of every word of the Bible, I soon persuaded myself that our Creed must be fully accepted."

(Autobiography, p. 18)

As a well-read thinker and world traveler, Darwin was familiar with world religions and cultural stories. To be fair, I think that we can assume that, in his frequent reference to the "theory of creation", he knew what he was talking about. So, what did Darwin mean by the "theory of creation"?

For Darwin, the structure and purpose of T/C is very similar to that of T/E. Both T/E and T/C are largely propositional, and are sets of propositions about causation. These propositions of T/C are intended to be true claims concerning the causes of facts. The most basic claim of T/C has the form "x caused y" in which 'x' is some god or supernatural power, and 'y' is a set of facts about the world.

As with T/E, to explain a fact is to identify the cause of a fact, and to identify the cause of a fact is to identify the set of conditions which make a fact necessary by forcing that fact to occur. The facts, 'y', for which T/C provides spiritual or religious explanations, are numerous and spread throughout the entire spectrum of religion and spirituality. From the mental sensation of synchronicity and oneness, to the virgin birth of Jesus, to vengeance upon infidels, to surviving

cancer, to making a touchdown in a football game; the proponents of T/C seek to explain certain facts by identifying the causes of these facts.

The differences between the many forms of T/C can be subtle, and most forms are molded into complex webs of dogma and ritual. It's easy to get lost in these structures of scripture and story, and to spend all your time in the comparison of the reasonableness and evidence for each structure. Darwin may fairly, but falsely I think, be charged with oversimplification in his definition of T/C. He distills the many forms of T/C into one fundamental and necessary claim; that some god causes some facts.

As with T/E, T/C is composed of several general principles that further define and specify the conditions of causation. In Darwin's terms, the principles of T/C claim to "make intelligible," "account for," "understand," "comprehend," and "explain" certain facts of life. Another absolutely crucial element shared by T/E and T/C; each claims that their principles are true; each claims to correctly identify the causes of some facts.

A. Supernatural power

"Amen, amen, amen, amen - there's a higher power!"

- "There's a Higher Power", gospel song by the Louvin Brothers

The principle of supernatural power claims that "Certain facts are so extreme and unusual that they violate the limits of natural law.". In order to function in our daily lives, and to secure food, water, and shelter, every group of humans in every culture must accept certain limits on possible actions - we can't flap our arms and fly, nor breathe water, nor drink dirt, nor walk through a brick wall. All humans, and most other creatures, have a deep, intuitive understanding of the basic stimulus/response relationship. These stimulus/response events of our everyday lives are instances of causation, the stimulus is the cause and the response is the effect. Within each culture, humans recognize some causal relations and their daily lives are organized accordingly; in order to stay alive, some actions a person can and must do, other actions a person cannot and must not do. Humans recognize some limits of causation.

However, throughout history, some people, some animals, some unseen actors, seem to possess powers that defy natural law. Various observers have recorded instances of miracles (Jesus turning water into wine, Jesus being crucified and rising from the dead, a shaman making rain, a magician pulling a rabbit from a hat, then making it disappear.), prophecies (the city walls will fall,

the war will come, a leader will appear) and revelations (dreams, visions, speaking in tongues) during which certain actors exceed the limits of natural law. By creating something out of nothing, by doing the undoable, by foretelling the future, some individuals seem to have access to another world.

The principle of supernatural power claims to identify the cause of instances of exceptional facts. The cause is identified as some form of god, representative of god, superhero or space alien, and the effect is an event (miracle, prophecy, revelation) which defies certain laws of nature. The principle explains the fact by claiming that the will or plan of the agent forced the amazing fact to occur, made the fact necessary, caused the fact.

B. Mysterious cause

The principle of mysterious cause is similar to the principle of supernatural power in that unusual agents and their intentions are claimed as causes, however, the facts to be explained may be quite ordinary, and not in defiance of natural law. A mysterious cause is ascribed simply because the real cause is unknown.

As described earlier, Darwin assumed a principle of causation which claims that reality is structured according to general laws of nature, and a theory of knowledge which claims that these general laws are knowable. Granting these assumptions, and granting that humans do know the causes of some events of their lives (the lightning caused the fire), and granting that some humans have a great curiosity to identify the causes of other parts of their lives, the principle of mysterious cause calls upon a special agent, or plan, to explain facts of which the cause is unknown. Sometimes, these facts with unknown causes call for explanation.

This principle is based upon a fundamental metaphysical assumption: every event has a cause. If the laws of propositional logic apply, then this statement “Every event has a cause.” is either true or false. There are certain facts that challenge this assumption: some facts concerning the make-up of subatomic particles, some facts concerning the transfer of genetic material from parent to offspring (mutation), and some facts concerning the entities and relations within the great distances of space (curvature of space affecting the speed of light), seem to reveal an odd grey area between causal necessity and randomness. Quantum mechanics is a serious and responsible theory of physics which attempts to explain the odd facts about minute particles and great distances. These facts legitimately demand philosophical analysis. However, our assumption and commitment to the truth of “Every event has a cause.”, is so deep and strong that even in the explanation of these random facts, we seek

to identify the cause of randomness. It would be a mistake to apply the principle of mysterious cause to these facts of randomness. The most responsible way to retain integrity when confronting mystery is to withhold judgment, admit ignorance, and keep searching. A common response to mystery is to collect evidence.

Darwin's sets of facts are not the facts addressed by theoretical physics. We have in front of us facts about our bodies engaged in the events of ordinary life. Both T/E and T/C agree upon certain facts and both make claims about the causes of those facts. The principle of mysterious cause is applied by T/C to make the leap between known and unknown causes. The principle is instantiated by individual acts of faith by which specific facts (total eclipse of the sun, a tragic accident, a spiritual experience of synchronicity) are explained by, or caused by, the plan or will of a creator. It is called upon to make sense of facts of our everyday lives.

The application of this principle is particularly confusing, but common, when it is called upon to identify the cause of the whole universe, or the cause of natural law, or the cause of life, or the cause of something rather than nothing, or the cause of causation. It is frequently called upon to make sense of life itself. Even Darwin occasionally applied this principle throughout his investigation of T/E:

“There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one...”

(Origin, p. 450, 6th)

The appeal of the principle of mysterious cause lies deep within our brains. To evaluate the truth, correctness and appropriateness of its application calls for the further examination of causation, over-causation, and the ontological status of the instances of causal relations. Later in this essay, I will further examine causation.

C. Sudden change

The principle of sudden change is a claim about evidence for causation. It claims that certain facts concerning the sudden appearance of something from nothing ("In the beginning God created the heaven and the earth."), or the sudden transformation of one kind of thing into another kind of thing (the rib of a male human into a female human, particles of gas and dust into living organisms,

water into wine) can occur only if caused by a supernatural power or mysterious cause. In religious and spiritual systems around the world a wide range of instances of sudden change serve as evidence for divine causation.

One of the main facts T/C uses as evidence for supernatural causation is the appearance of human beings on earth. Several properties of humans such as the uses of language, superior intelligence, spiritual yearning, and moral behavior seem to distinguish humans from other living things. Darwin argued against sudden change as evidence by showing that the claimed facts are not actual facts, or that the claimed changes are gradual, not sudden. I summarized those arguments under the discussion of T/E's principle of modification.

D. Authority

The principle of authority is not a claim about causation, it's a claim about the knowledge of causation. The instances of this principle are the ancient and current persons that have written certain religious texts, told certain stories, had certain dreams and visions or in other ways made claims to identify the cause of some facts. The principle of authority refers to scriptures, myths, creation stories, and other declarations by leaders and elders, and makes the claim that the propositions within each are true. These original claims to causation are assumed true and then, consequently, used to justify other claims. The claims made in holy scriptures, tribal myths, and divine revelations, are protected by tradition and ritual, and are considered to be true and unassailable.

T/C uses the principle of authority to justify a huge range of beliefs and behaviors. Statements from the Bible, Koran, Gita and any number of texts and stories serve as the premises upon which arguments for each religion are based. These texts and stories provide sets of beliefs that are accepted on faith, and justified by reference to authority.

Sources of authority make claims concerning the causes of facts. As long as sets of believers accept and have faith in the same claims, conflict is minimal. Problems with logical coherence and compatibility arise when the sources of authority make claims that are inconsistent. When one source of authority says one god is the cause, and another source says a different god is the cause, they can't both be correct. The main problem with the principle of authority is determining the conditions of truth when the sources of authority make claims that are inconsistent. The two main sources of inconsistency are either; first, the facts, or second, the causes of facts.

The only way to resolve the incompatibility between claims is to correctly identify both the facts, and the causes of facts. When the sources of authority make incompatible claims, the only resolution is to take the authors themselves to task and determine the truth of their claims. This process of justification requires that all sources of authority be subject to the identical conditions of truth and standards of evidence.

History has recorded the observations and theories of many great scientists, philosophers, religious and political leaders, and each has acquired his/her own group of followers. For each subject at issue, it is up to the followers of the figures of authority to examine and test incompatible claims. At issue in the conflict between T/C and T/E is the cause of certain facts concerning living things, in particular, certain facts concerning human beings and their origins.

As previously described in the discussion of Chapter VII of the 6th Edition of Origin, Darwin takes all authors of holy scriptures, and all leaders of every religion, to task for claims concerning the causes of certain facts about human beings and other living things. He casts an extremely wide net that captures every author of the Bible and Koran, every witch doctor along the Amazon, and every speaker of tongues, snake handler and magic mushroom lover. T/E claims that each human author, and each human character of scripture and creation story, without exception, are themselves composed of parts of very different and ancient creatures, and each is a necessary consequent of a long chain of descent. Every human being that has ever lived is an instance of the principles of T/E. Old claims to special causation are equally subject to the same conditions of truth and evidence as current claims. Darwin's T/E is a great equalizer that significantly weakens the principle of authority, and forces the proponents of T/C to show that all claims to special causation, even those from ancient and holy texts, are true.

Conclusion

There is a great deal at stake in the assessment of Darwin's argument. T/E challenges deeply held, highly valued beliefs concerning life after death, existence of god, freedom of the will, relationship with nature, and purpose of life. Unlike many theories of science which seek to explain gravity, molecular structure, speed of light, and relativity of time and space over great distances, both T/E and T/C are deeply personal, and directly address each person's understanding of their place in this world.

Darwin believed that T/E and T/C are logically incompatible, that both cannot be true. Unequivocally, the entire Origin of Species is bent on showing that T/E is true, and T/C is false. The debate rages on, some people are killed and some are elected based upon the side they take, yet few people understand the claims, and assumptions, of both sides. I have tried to show what Darwin means by T/E, what Darwin means by T/C, and the assumptions of his argument. What are the points of dispute? Was Darwin right or wrong? Are the theories true or false?

Section III

Are the Theories True?

In reading Origin, Variations, Expressions, and Descent, I'm struck with Darwin's aggressiveness against T/C. Although T/C was the background and prevailing explanation of his day, he could have developed T/E, and presented his evidence and conclusions, without mentioning T/C. The principles of T/E make sensible claims and are supported by evidence without using T/C as a foil. Darwin clearly believed that the two theories are incompatible and contradictory, and he took many opportunities to argue not only that T/E is true, but also that T/C is false.

As discussed in Section I, in order to fairly evaluate the premises of DA, we need to be clear that meanings of the terms and underlying philosophical assumptions are the same. We examined the meanings of the terms “fact”, “theory”, and “explanation”, and the assumptions concerning logic, truth, knowledge, and causation. In order to evaluate the success of DA, we need to further examine two more of Darwin's crucial philosophical assumptions: the principle of identity and the principle of evidence.

Assumption 5: Identity

“Naturalists, as we have seen, try to arrange the species, genera, and families in each class, on what is called the Natural System. But what is meant by this system? Some authors look at it as merely as a scheme for arranging together those living objects which are alike, and for separating those which are most unlike; or as an artificial method of enunciating, as briefly as possible, general propositions, that is, by one sentence to give characters in common, for instance to all mammals, by another those common to all carnivores, by another those common to the dog-genus, and then, by adding a single sentence, a full description is given of each kind of dog. The ingenuity and utility of this system are indisputable. But many naturalists think that something more is meant by the Natural System; they believe that it reveals the plan of the Creator; but unless it be specified whether order in time or space, or both, or what else is meant by the plan of the Creator; it seems to me that nothing is thus added to our knowledge. Expressions such as that famous one by Linnaeus, which we often meet with in a more or less concealed form, namely, that the characters do not make the genus, but that the genus gives the characters, seem to imply that some deeper bond is included in our classifications than mere resemblance. I believe that this is the case, and the community of descent – the one known cause of close similarity in organic beings – is the bond, which though observed by various degrees of modification, is partially revealed to us by our classification.”

(Origin, p. 386-387 6th)

This quote, in conjunction with many other references to T/C throughout his writings, provides a basic formulation of Darwin's principle of identity.

Darwin's principle of identity (DI).

The cause of order (e.g. similarity between organisms, relation between parent and offspring) in time or space, or both, must be specified in time or space, or both.

Darwin's use of theorization to understand the origin of species and, although he denied it, the origin of all life on earth, is grounded on this assumed principle. DA relies on this assumption to the extent that if the principle is necessary and true, then DA succeeds and prevails, and if the principle is relative or false, then DA fails.

Both T/C and T/E attempt to explain a fact by identifying the cause of that fact. In order to identify the cause of a fact, it is necessary to identify three separate elements; the cause, the effect, and the relation of necessity between the cause and the effect.

A necessary condition for even proposing a theory which claims: “x caused y”, is that both “x” and “y” are identifiable. At the very heart of theorization is the need to distinguish and identify cause and effect. Darwin assumes and uses a particular principle of identity to formulate and justify T/E. This principle specifies the conditions for determining what it is for an x to be an x, and what it is for a y to be a y. The process of identification sorts out what qualifies as an instance of general causal proposition.

It's hard to overstate the importance of Darwin's principle of identity. Much of the dispute between T/E and T/C is due to the correct application of this assumption. Consequently, further examination of this principle is needed in order to understand the point of incompatibility between the two theories.

In his 1959 book, Individuals, P.F. Strawson provides an insightful analysis of identity. While I disagree with some of the conclusions, this study, I think, further reveals and clarifies Darwin's own principle.

“It is not merely a happy accident that we are often able, as speakers and hearers, to identify the particulars which enter into our discourse. That it should be possible to identify particulars of a given type seems a necessary condition of the inclusion of that type in our ontology. For what would we mean by claiming to acknowledge the existence of a class of particular things and to talk to each other about members of this class, if we qualified the claim by adding that it was in principle impossible for any one of us to make any other of us understand which member, or members, of this class he was at any time talking about? The qualification would seem to stultify the claim.”

(Individuals, p. 3)

Strawson's principle of identity (SI)

x exists if and only if:

S1: x is identifiable in time and space

S2: x is re-identifiable in time and space

The ground of S1 is the Law of the Excluded Middle of propositional logic. The ground of S2 is the distinction between numerical identify and qualitative identity. Both conditions must be satisfied in order for any claimed entity to qualify as an entity.

An essential condition for the identifiability of any 'x' is that 'x' must be distinguishable from 'not-x'. In purely formal terms, the proposition " $x \neq (\text{not-}x)$ " is logically necessary, that is, it's denial is contradictory, it has no content, it would be true in a universe with no x's, and it is true independently of the question concerning whether there are any x's.

However, the subject of Darwin's principle of identity is not logical truth, nor the relation of logic to reality. Both T/E and T/C already assume that living organisms exist and that Darwin's list of facts are indeed facts. The primary issue of both theories is to identify the causes of these facts. A principle of identity is used by each theory to formulate the conditions anything must meet in order to be the cause of a fact. The function of the principle is to specify what it is to exist as a cause, and to specify what it is to instantiate a general causal proposition that is true.

We talk about the world by making claims about objects and relations between objects. In everyday life, both proponents and opponents of T/C and T/E use language to express their experience and navigate their circumstances. If I say, "I am standing in a room with one table and four chairs.", in order for the statement to be true, it must meet certain conditions: my body is standing upright in a room at a time t, one table and four chairs are in the same room at t. If any of these conditions do not obtain, then the statement is false. If the statement is true, it follows that the room exists, and within that room my standing body exists, one table exists, and four chairs exist. The conditions of truth are satisfied.

As discussed in Section I, Darwin assumed a theory of truth that claims correspondence between a proposition and reality such that "P" is true if and only if P. This correspondence theory also maintains that there is a necessary connection between reality and true propositions such that reality causes the proposition to be true. The states of affairs that make propositions true precede those propositions.

According to the Law of the Excluded Middle, the statement "I am standing in a room with one table and four chairs" is either true or false. What makes the statement true are certain states of affairs concerning the room, me, the table and the chairs. The same can be said of all propositions in all languages – what makes a proposition true are the states of affairs that correspond to the proposition. The principle of identity used by both the proponents and opponents of T/C and T/E is

that structure within states of affairs that distinguishes the individuals that constitute those states of affairs. The truth of our statements about states of affairs is determined by the individuals that make up those states of affairs. An essential part of the correspondence between propositions and states of affairs is that the individuals within states of affairs are distinguishable from other individuals. A necessary condition of making true statements is that individuals within states of affairs are identifiable. Part of what it means to be identifiable is to be distinguishable from other individuals.

In Individuals, Strawson claims the condition of individuation is necessary for the use of ordinary language and that any claim to the existence of objects that are not identifiable in principle is not appropriate. He maintains that to use ordinary language to have the discussion about the existence of cause x is to assume the necessary condition of individuation, and any consequent claim that x is not identifiable is either contradictory or meaningless. Religious believers may claim that god is too great to be identified, or that the distinction between subject and object is illusory, or created by the perceiver. However, according to Strawson, in order for a believer to use language and thought to make, and argue against, the point of identifiability, he must assume the point.

What is it that makes possible the distinction between 'x' and 'not-x'?

First, x exists if and only if x is identifiable in time and space.

“For all particulars in space and time, it is not only plausible to claim, it is necessary to admit, that there is such a system; the system of spatial and temporal relations in which every particular is uniquely related to every other.”
(Individuals, p.10)

“To this it may be replied that the system of spatio-temporal relations has a peculiar comprehensiveness and pervasiveness, which qualify it uniquely to serve as the framework within which we can organize our individualizing thought about particulars. Every particular either has its place in this system or is a kind the members of which cannot in general be identified except by reference to particulars of other kinds which have their place in it; and every particular which has its place in the system has a unique place there. There is no other system of relations between particulars of which all this is true.
(Individuals, p. 14)

“The more we think about causation, the clearer becomes our realization that the possibility of causation between distant objects depends on a shared space-like coordinate system in which these objects are located, a scheme that individuates objects by their “locations” in the scheme. Are there such schemes other than physical space? I don't believe we know of any.”

(Physicalism, by Jaegwon Kim, p. 91)

Strawson's analysis of individuation accords with and clarifies Darwin's principle of identity: a necessary condition for participating in a causal relation is to be an individual that is distinguishable from other individuals; and a necessary condition for being distinguishable is to have a unique location in the framework of time and space. In order for the claim “x caused y” to be true, it must be the case that both x and y are identifiable at a particular time and in a particular place.

Second, x exists if and only if x is re-identifiable in time and space.

This condition of Strawson's principle of identity claims that in order for the statement “x caused y” to be true, both x and y must exist as separate unified individuals through continuous points of time and continuous locations in space.

“...we must have criteria or methods of identifying a particular encountered on one occasion, or described in respect of one occasion, as the same individual as a particular encountered on another occasion or described in respect of another occasion.”

(Individuals, p. 20)

For example, say there is an apple on the table in your kitchen. As discussed under S1, necessary conditions for identifying the apple and the table are that both the apple and table are separate individuals which are distinguishable and distinct from each other, and necessary conditions for one object being distinguishable from another object are that both objects are locatable in the framework of space and time. Consequently, according to S1, this is a fact: at time t, an apple is on the table in the kitchen.

Further, say night falls and it's time to go to bed. You turn out the lights, go to the bedroom and go to sleep. In the morning, you return to the kitchen and turn on the lights. In the kitchen, you

see an apple on the table. Is it the same apple on the same table? If yes, what is it that makes it the same apple on the same table?

In order to make sense of these questions, we need to describe two ways we use the words “the same” and their associated conditions. We need to understand the distinctions we make between “the same” and “not the same”, and whether those distinctions are legitimate and true.

Our two main uses of the words “the same” are dependent upon the distinctions we make between qualitative identity and numerical identity. Qualitative identity is a general principle of which similar, but separate, individuals are instances. This form of identity is based upon the concept of similarity; similarity is based upon the concept of like properties; and the concept of like properties is based upon the comparison of separate and distinct individuals in a unified framework of time and space. Two individuals are qualitatively identical if and only if they do share selected properties and do not share locations in time and space. For example, two apples are “the same,” in the sense of qualitative identity, if they are separate and distinct individuals that share selected properties (e.g. size, shape, color, taste...).

Numerical identity, on the other hand, is not based on the concept of similarity, nor on the concept of the sharing of properties. Numerical identity is a general principle of which individuals that share continuous location in a unified framework of time and space, and that share all parts at every specific point in both time and space, are instances. Two individuals are numerically identical if and only if they share all parts at every location in a continuous framework of time and space. For example, the apple on the table in the morning is numerically identical to the apple on the table the previous evening if and only if, during the night, and in the kitchen, the apple in the morning shared all parts and every location with the apple in the evening.

One of the major differences between qualitative identity and numerical identity is that relations between numerically identical individuals and other individuals are transitive; whereas relations between qualitatively identical individuals and other individuals are not transitive. For example, for any individuals x , y , z , if x is numerically identical to y at t^1 , and not numerically identical to z at t^1 , and if x is larger (smarter, greener, quieter) than z at t^1 , then y is larger than z at t^1 . Also, if x and y are numerically identical at t^1 , and x is larger than z at t^1 but smaller than z at t^2 , then y is larger than z at t^1 and smaller than z at t^2 .

However, for individuals x , y , z , if x is qualitatively identical to y at t^1 , and if x is the only thing within 2 feet of z at t^1 , then y is not within 2 feet of z at t^1 . Also, if x is qualitatively identical to

y at t^1 , that relationship has no bearing on the relation between x and y at t^2 . The relations between x, y, and z are not transitive.

Another major difference between qualitative and numerical identity is that individuals that are numerically identical must share all parts at each specific point of time and space, and must share at least one part through space and time. For example, if x is numerically identical to y, then at t^1 , x and y share all parts in space, and at t^1 and t^{10} , x and y share at least one part in space. So, if you put a caterpillar in a box at 4pm on Tuesday, April 5, 2018, then it spins a cocoon, and at noon on Tuesday, April 19, 2018, it emerges from the cocoon as a butterfly; that butterfly is numerically identical to that caterpillar. What makes the caterpillar and butterfly numerically identical is that at any time between April 5 and April 19, that caterpillar and that butterfly share all parts of their bodies; and, on April 5 at 4pm and April 19 at noon, that butterfly and that caterpillar literally shared at least one part of their bodies; and that part which they shared did not change.

This literal sharing of all parts of a physical body at each location of time and space, and some parts of a physical body at different locations of space and time, are necessary conditions of numerical identity. For any individuals x and y, if x and y are numerically identical, then at any one point in time and space, x and y share all parts, and at different times, they share some parts. Let's take another example, if a human embryo develops, is born, grows up, lives a life, then dies and is cremated; what makes the pile of ash "the same" as the human baby is that at any one time (going forward in time for the baby or backward in time for the ash), the human body and the ash share all parts of their bodies, and from conception until placed in an urn, the embryo and the ash literally share some parts. There is literally a unit of matter, or form of matter, that stays the same and doesn't change.

On the other hand, if individuals x and y are qualitatively identical, at any point in time, x and y share no parts, and through time, x and y share no parts (possible counter-example: if x eats y, then will y eventually become part of x?). As mentioned, the principle of qualitative identity is based upon the concept of similarity; the concept of similarity is based upon the concept of like properties; the concept of like properties is based upon the comparison of individuals in a unified framework of space and time. Hence, in order for x and y to be qualitatively identical, they must be distinct and separate individuals in time and space and they have similar properties at one point in time.

It may be the case that, at different times, the similarity of x and y is evidence that x and y are numerically identical (e.g. morning star and evening star). However, if it is discovered that x and y

are numerically identical, the criterion of similarity is no longer a necessary condition for being “the same.”

The concepts of qualitative and numerical identity are deeply engrained in our thoughts, sense experience, and communication with others. There is no doubt that we use these concepts and live our lives as if they are true about the world; that the instances of these two kinds of identity are real and actual, for both humans and other sentient organisms. For example, if a momma bear leaves her cub near a tree in order to go forage for food, when she returns she knows that the cub near the tree is numerically identical to the cub she left a while ago. When a salmon leaves the ocean and swims up a river to spawn, it somehow knows that this river is numerically identical to the river of its own birth. What makes these events possible is that the salmon, the river, the momma bear and the baby bear are individuals that are identifiable and re-identifiable in time and space.

So far, Darwin's principle of identity concurs with Strawson. Darwin frequently uses this principle in the comparison between T/E and T/C and much of the success of DA depends upon it. However, is the application of this principle of identity the correct and appropriate way to identify the cause of a fact? Do the proponents of T/E and the proponents of T/C use the same principle in attempting to identify the causes of the facts of DA?

Strawson claims that an individual exists if and only if that individual is identifiable and re-identifiable in a unified framework of time and space. The notion of identifiability depends upon the Law of the Excluded Middle of propositional logic, and the notion of re-identifiability is dependent upon the distinction between qualitative identity and numerical identity.

Critics of Strawson argue, first, that there are no instances of numerical identity and, second, that the laws of propositional logic and the related laws of ordinary language are simply one set of rules amongst other “equally valid” sets of rules (see Fear of Knowledge, by Paul Boghossian, p.2-5). Strawson counters this philosophical skepticism with a transcendental type argument claiming that his principle of identity is a necessary condition of any language at all, and that to use language to deny language is incoherent.

Strawson's opponents develop a general form of philosophical skepticism which claims that there are no instances of numerical identity because these instances are reducible to instances of qualitative identity. They base this claim upon the conviction that observation is a necessary condition for the knowledge of the existence of particulars, and that the unobserved continuity of individuals is an illusion, or an imaginary extension of sense perception, or a cultural convention of

language users. While the proponents of this skepticism accept that individuals within a field of observation are identified by their spatial and temporal location in the field, they reject the position that different fields of observation are unified into one framework and that unobserved individuals retain their properties. Consequently, for any observer, each time the field changes (waking from sleep, turning your head with eyes closed), the framework changes. Each morning is a new and different world, and the connection to yesterday's world is one of imagination, assumption, or social convention. Today's world is very similar to yesterday's world, but since knowledge is dependent upon sense experience, and since observation ceased, we cannot know that yesterday's world and today's world are the same world. They claim that the continuous identity of objects through time and space is in the eye or mind of the beholder, and not in a mind independent structure of time and space.

In response to this general skepticism, Strawson presents an argument that such a position is incoherent and somehow contradictory.

“There is no doubt that we have the idea of a single spatio-temporal system of material things; the idea of every material thing at any time being spatially related, in various ways at various times, to every other at every time. There is no doubt at all that this is our conceptual scheme. Now I say that a condition of our having this conceptual scheme is the unquestioning acceptance of particular identity in at least some cases of non-continuous observation.

(Individuals, p.27)

Strawson goes on to accuse the philosophical skeptic of a type of circularity. He argues that if unobserved continuity were never the case, then the language and its related conceptual scheme would not exist to formulate the question; the observer would not exist to ask the question; and each conceptual scheme of each observer would be totally independent with no conditions upon which to base a comparison of the objects of each system. Hence, to express doubts about numerical identity is to use the very conceptual scheme that is caused by numerical identity; to doubt numerical identity is to assume this identity.

I believe that Strawson's accusation of circularity is correct, and that his transcendental argument does reveal the conditions of using language to formulate DA. This argument also reveals the conditions of what it is to exist as a cause, and as an effect, in the premises of DA. It is a fact that

most creatures act as if numerical identity is the case. It is the conceptual scheme within which we do live our lives. If any two observers accept any fact about any individual located within the one unified system of time and space, then the principle of numerical identity is assumed and justified because the principle is a necessary condition of any discussion. Numerical identity is a condition an individual must satisfy in order to be an instance of a true general causal principle. In order to be an instance, any individual must be identifiable and re-identifiable within the one unified framework of time and space.

This same transcendental argument used to support numerical identity, and to blame critics of circularity, can be extended against other forms of relativism. A coherence theory of truth, which rejects the correspondence theory of truth, measures truth by assessing the coherence and consistency of certain propositions within each belief system. The coherence theory claims that truth is determined by the coherence and consistency of each system of propositions. Strawson's transcendental argument maintains that critics who claim that truth does not consist of the correspondence between propositions and reality, must assume the correspondence criteria in order to make the claim against the correspondence criteria, i.e. they say it's 'really true' that truth consists of coherence, not correspondence. The relativist claiming that there is no objective truth, and claiming that facts are determined by paradigms or epistemic systems, must use the criteria of objective truth in order to make the claim that there is no objective truth. The relativist claims that it is true that truth is relative.

If I'm correct that he shares Strawson's principle of identity, when Darwin says,

“ Lastly, looking not to any one time, but to all time, if my theory be true, numberless intermediate varieties, linking closely together all the species of the same group, must assuredly have existed.”

(Origin, p. 163, 6th)

what he means is that, since the beginning of life on earth, the principles of T/E obtain and every organism is, and has been, an instance of these principles. Every living thing is, and has been, the offspring of a parent, and without exception, every parent and offspring are individuals that are identifiable and re-identifiable in time and space.

Strawson provides criteria by which the cause and the effect are identifiable; location in time and space. I think that he has more to add to this discussion of DA:

“Hence, as things are, particular identification in general rests ultimately on the possibility of locating the particular things we speak of in a single unified spacio-temporal system...

Given the general character of the conceptual scheme I have described, is there any one distinguishable class or category of particulars which must be basic from the point of view of particular identification?...is there a class or category of particulars such that, as things are, it would not be possible to make all the identifying references which we do make to particulars of other classes, unless we made identifying references to particulars of that class, whereas it would be possible to make all the identifying references we do make to particulars of that class without making identifying references to particulars of other classes?

...they must be three dimensional objects with some endurance through time. They must be accessible to such means of observation as we have; and, since those means are strictly limited in power, they must collectively have enough diversity, richness, stability and endurance to make possible and natural just that conception of a single unitary framework which we do possess...Hence, given a certain general feature of the conceptual scheme which we possess, and given the character of the available major categories, things which are, or possess, material bodies must be the basic particulars.”

(Individuals, p. 28-29)

Strawson's further contribution to DA is the position that at least part of the cause and part of the effect of any explanation must be a material body. In the above quote, he argues that only material bodies have numerical identity at different times and different places. As previously explained, if x and y are numerically identical, then all of their relations are transitive and true referential statements about x are also true of y. What makes these statements true “identifying references” is that x and y share coordinates of time and space. Material bodies are basic because only material bodies can share these coordinates and be re-identified as numerically identical. In order to be an instance of a general causal principle, at least part of the cause, and part of the effect, must be identifiable and re-identifiable. Since only material bodies satisfy these conditions of identity, part of the cause must be a material body.

In his search for an explanation of certain facts, Darwin uses and depends upon a specific principle of identity. Throughout his writings on T/E, a deep sense of disparity prevails – T/E is true and T/C is false. His grounds for this conviction are that T/E does correctly identify the cause of facts

and that T/C does not correctly identify the cause of facts. Although not as well defined, Darwin's principle of identity is very similar to Strawson, and this comparison is useful for understanding the process of identifying causes of facts.

If they are correct, then at least part of cause of Darwin's facts are material bodies and relations between material bodies. However, is there another part of the cause? Besides the material bodies involved a causal event is, is there also a non-material, supernatural, spiritual or mental part of the cause? Strawson says "yes" and Darwin says "no." Again, I think a comparison of these two thinkers will be helpful in understanding consciousness and the status of non-material or mental causation.

We have seen that Strawson claims "Material bodies are basic.", and that his justification of the claim uses a principle of identity that accords with Darwin's argument. However, he makes a further claim that could affect T/E and must be addressed. Strawson also claims that "The concept of a person is primitive."

"So far, I have said that the concept of a person is to be understood as the concept of a type of entity such that both predicates ascribing states of consciousness and predicates ascribing corporeal characteristics, a physical situation, etc., are equally applicable to an individual entity of that type. All I have said about the meaning of saying that this concept is primitive is that it is not to be analyzed in a certain way or ways. We are not, for example, to think of it as a secondary kind of entity in relation to two primary kinds, viz. a particular consciousness and a particular human body."

(Individuals, p. 101)

Strawson develops a complex and subtle argument concerning language, logic and identity which leads to the conclusion that persons are special kinds of entities in the world. He argues that the facts concerning how humans use language make logically necessary that there are two kinds of entities in the world: material bodies and persons. This conclusion about persons and what exists is, I think, incompatible with Darwin's T/E such that, if T/E is true, then Strawson's concept of a person is neither primitive nor true.

Strawson's argument that the concept of a person is primitive:

1. It's a fact: humans use language in speaking and writing. A primary function of ordinary language is to identify and describe the world around us. Part of the structure of language is the

process of ascribing predicates to subjects: m-predicates ascribe properties to individuals that are material bodies and these predicates do not imply states of consciousness (e.g. “weighs 10 stone,” “is in the drawing room”). P-predicates, on the other hand, ascribe properties to individuals that are material bodies, and that are conscious. P-predicates imply possession of states of consciousness (e.g. having sensations, intentions, feelings, thoughts, etc., which are expressed in terms such as “is smiling,” “is going for a walk,” “is in pain,” “believes in God.”)

2. A necessary condition of ascribing any m-predicate or any p-predicate to any individual is that there must be, in principle, some way of telling (i.e. “logically adequate kinds of criteria” - Individuals, p. 102) whether that individual possesses that property. For any individual X and for any property A; either XA or X(not-A).
3. The criteria for ascribing m-predicates are satisfied by observation (see, hear, touch, smell, taste).
4. However the criteria for ascribing p-predicates are not satisfied by observation. You can't see consciousness. Ascribing the property of consciousness to oneself (I am in pain) is directly evident independently of observation.
5. Strawson's principle of identity: an individual exists (has identity) if and only if that individual is identifiable and re-identifiable in space and time.
6. Consequently, a necessary condition of ascribing p-predicates to oneself is that a person must be able to distinguish (individuate) oneself from not-oneseff.
7. Independent non-material subjects of consciousness (ego, soul, self) are not distinguishable, and, thus, are not identifiable.
8. However, it is a fact that we ascribe p-predicates to ourselves. We do distinguish between ourselves and others.
9. To even ask the question of whether the criteria of ascribing p-predicates to oneself are satisfied is to assume that the subject of p-predicates does exist.
10. Assuming the criteria for ascribing p-predicates to oneself and to other persons is a necessary condition of learning language.
11. In order to deny, or even doubt, the concept of a person, you must assume it.
12. Therefore, the concept of a person is primitive.

Strawson seeks to avoid dualism by means of linguistic analysis. He performs this analysis by determining the necessary and sufficient conditions of using ordinary language to ascribe predicates to subjects, more specifically, the conditions of ascribing states of consciousness to the numerically identical entity to which material properties are also ascribed. His main criticism of both Cartesian dualism (that material bodies and non-material souls are separate substances with the soul inhabiting the body) and the no-ownership theory (an odd, mystical idealism with one mind and many bodies), is that both positions fail to satisfy his own principle of identity: x exists if and only if x is identifiable and re-identifiable in time and space. He claims that dualism fails – the correlation between material bodies and subjects of consciousness cannot be established because subjects of consciousness cannot be identified.

Strawson's reason for asserting that the concept of a person is primitive is to explain the fact that we correctly identify states of consciousness in ourselves. We do, in fact, correctly identify thoughts, dreams, sensations, emotions, etc., in ourselves. However, if his principle of identity is true, x can exist only if x is distinguishable from not-x. We distinguish states of consciousness in ourselves by observation, but since states of consciousness in others are invisible and not accessible to observation, there must be some other way to make that distinction. Strawson argues that the criteria for distinguishing p-properties in others is built into ordinary language. The concept of a person is primitive because it is made necessary by learning language. The challenge of skepticism, that is, to doubt the existence of p-properties in others, leads us into a kind of paradox: to use language to reject the necessary conditions of language is to accept language. Strawson's way out of the paradox is to show that the concept of a person must be assumed; that the concept of a person is primitive.

In Individuals, Strawson proposes and defends two claims that, I think, are helpful in analyzing Darwin's argument. In defending his claim “material bodies are basic,” he delineates a principle of identity that is generally in accord with common sense, and strictly in accord with Darwin's own principle. I'll go so far as to maintain that Strawson's principle of identity is correct, true, and that it corresponds with reality.

However, Strawson fails to establish his claim “The concept of a person is primitive.”, and part of the reason it fails is that the claim is incompatible with Darwin's T/E.

First, Strawson does not avoid dualism. Regardless of his denial, an individual to which both m-predicates and p-predicates are ascribed is a different kind of entity than an individual to which

only m-predicates are ascribed. Strawson's theory of persons is a form of property dualism, and property dualism is dualism. Under Strawson's account, "persons" constitute a set of entities that are distinct from "not-persons." The criteria that distinguishes the two sets is that persons have knowledge of their own consciousness by means of objects of consciousness (sensations, feelings, thoughts and other qualia) that are directly evident independently of observation. For Strawson this direct evidence, plus the use of language to ascribe consciousness to oneself, entail a special entity that is not subject to the same laws of causation as not-persons. For example, when a person steps on a nail, then feels pain, then winces and says "ouch," the feeling of pain is (a) an effect of the traumatic event, and (b) a cause of the utterance. In comparison, when a car runs over a nail and punctures a tire, there is no sensation or feeling in the causal chain between the nail and the flat tire. According to Strawson's account, the distinction between a person and a non-person (car) is that, with persons, a sensation is part of the causal chain, and with not-persons, there is no sensation in the causal chain.

Up to this point, I think Strawson is correct: for some individuals, states of consciousness are both causes and effects in the causal chain of events, and for other individuals, states of consciousness are not part of the chain. However, when he takes the next step and claims that a person is a "type of entity to which both p-predicates and m-predicates apply" and that the concept of a person is primitive and must be assumed, he violates his own principle of identity and becomes a dualist. Suddenly, there are two kinds of entities, persons and not-persons, and the necessary and sufficient conditions for distinction are a conjunction of the logic of ascribing predicates to subjects and the nature of direct evidence.

"Clearly there is no sense in talking of identifiable individuals of a special type, a type, namely, such that they possess both m-predicates and p-predicates, unless there is in principle some way of telling, with regard to any individual of that type, and any p-predicate, whether that individual possesses that p-predicate. And, in the case of at least some p-predicates, the ways of telling must constitute in some sense logically adequate kinds of criteria for the ascription of the p-predicate."

(Individuals, p. 102)

Strawson's argument is based upon a certain understanding of language and truth that is common and, I think, compatible with Darwin:

- a. nouns name subjects (apple, money, sunset)
- b. predicates are adjectives that ascribe properties to subjects (is red, is important, is beautiful)
- c. the ascription of a predicate to a subject is true (obtains, correct) if and only if that subject possesses (has, is) the property ascribed by the predicate.

Strawson argues that the logic of language entails existence and that a, b and c provide the grounds for this claim. Given the fact that we do use ordinary language to name objects and to ascribe properties, he maintains that the necessary conditions of such naming and such ascription are that, at least in some cases, the subject exists, the subject has the properties ascribed, there is a way of determining whether the subject exists, and there is a way of determining whether the subject has those properties.

This transcendental argument which attempts to establish the necessary conditions of the use of propositional language is a strong refutation of the skeptic. If the skeptic uses language to deny the possibility of existence (“Nothing exists.”), the possibility of knowledge (“I know that there is no knowledge.”) or the possibility of truth (“It's true that there is no truth.”), they get caught in a trap of assuming what they are denying. The main implication of Strawson's argument is that a skeptic of existence, knowledge or truth cannot be so general as to include all instances of existence, knowledge or truth. Whereas specific instances of the existence of some individuals, the knowledge of some facts and the truth of some propositions, can be called into question, denials of all existence, all knowledge, or all truth are contradictory.

This leg of Strawson's argument depends upon a specific relationship between the axioms of propositional logic and the rules of ordinary language. He maintains that the functions of naming, reference and ascription of predicates can occur only if the Law of Identity (“If a proposition is true, then it is true”), the Law of the Excluded Middle (“A proposition is either true or false”) and the Law of Non-contradiction (“A proposition cannot be both true and false”) are enforced. To use language to name, refer, and ascribe predicates requires that the subjects of names, reference and predicates are separate and distinct. What they are must be distinct from what they are not.

The debate concerning the relations between logic, language and reality has a long, complex history that has resulted in incompatible theories. The purpose of my analysis is to isolate and describe the underlying philosophical assumptions of Darwin's Argument. I believe that the first part of Strawson's argument concerning persons helps elucidate Darwin's assumptions. By using ordinary language to name, refer, and ascribe predicates to subjects, both the proponents of T/C and the

proponents of T/E must assume that some subjects do exist, that some propositions which ascribe predicates to subjects are true, and that some propositions which ascribe predicates to subjects are known to be true. Up to this point, Strawson and Darwin are in accord. The questions now become: Which subjects exist? Which propositions are true? And which propositions are known to be true?

However, the second leg of Strawson's argument concerning persons is misleading and is the point at which Darwin and Strawson part ways. Strawson seeks to show that individuals to which both p-properties and m-properties are correctly ascribed are a different kind of entity than those individuals to which only m-properties are correctly ascribed. He claims that direct evidence of states of consciousness in one's own case entail that p-properties exist and create a different kind of entity which is made necessary by the logic of propositional language and must be assumed.

Strawson and Darwin part ways over the issue of what kinds of entities exist. Strawson argues that ascriptions of states of consciousness to oneself are, at least in some cases: (A) necessarily true due to the logic of propositional language (B) knowable in a direct process that is separate and distinct from observation and (C) this process implies that individuals with both p-properties and m-properties are a different kind of entity than individuals with only m-properties.

I believe that Strawson's claims concerning the ascription of states of consciousness to oneself are incorrect and fail to show that "the concept of a person is primitive":

(A). Strawson seeks to avoid an all-pervasive skepticism such as Descartes' "evil genius" that casts a spell over a person and makes false any statement concerning one's own states of consciousness. In his famous dictum "I think, therefore I am" Descartes attempts to formulate the foundations of knowledge that are infallible and undoubtable – a claim to absolute certainty of one's own existence. It's an obvious argument that captures a sense of isolation and perspective that has had a great influence in the history of human reflection. Yes, there is thinking, there is feeling, there is a sense of identity, but what is that "I" in Descartes' statement?

Descartes developed an explanation of states of consciousness that has become the standard of traditional substance dualism: a human being consists of two kinds of substances, a physical, material substance (body) and a mental, non-material substance (mind, soul, self). Physical properties (size, shape, number) are ascribed to physical substance and properties of consciousness (sensation, emotion, belief) are ascribed to non-material mental substance. A human being is a union of both kinds of substances which exist separately yet interact, this relationship being an issue of much controversy in the history of philosophy and religion.

The substance affirmed by “I think, therefore I am” is the non-material, mental substance that is subject of the properties of consciousness, and each mind/soul possesses the objects of consciousness such as beliefs, intentions, dreams, sensations and such. The necessity of Descartes statement is not logical necessity, that is, its denial is not contradictory. Rather, the necessity depends upon the apprehension of states of affairs that cannot be wrong, that are infallible, that are self-evident. One's knowledge of one's own consciousness is certain through direct evidence.

Strawson also relies upon a kind of necessity - the ascription of at least some p-properties to oneself cannot be false. We do ascribe p-predicates and m-predicates to ourselves: the ascription of m-predicates is justified by observation of an individual that is identifiable and re-identifiable in time and space; p-predicates can be ascribed only to individuals that are instances of this same principle of identity, and p-predicates are correctly ascribed to oneself on the basis of direct evidence. However, the logic of language (laws of propositional logic: identity, non-contradiction, and excluded middle) require that properties cannot be ascribed to only one individual but must be ascribed to one individual amongst other individuals. P-properties must be ascribed only to identifiable individuals, i.e., only to material bodies. That it is possible to correctly ascribe p-properties to oneself is known by direct evidence. That it is possible to correctly ascribe p-properties to others is made necessary by the logic of language.

Whereas Descartes argues that the infallibility of his dictum justifies the claim to the existence of mental substance, Strawson argues that the logic of language by which p-properties are ascribed to oneself justifies claims to the existence of an entity possessing both p-properties and m-properties. In ascribing p-properties to oneself, the concept of a person is assumed – is primitive.

(B). Both Descartes and Strawson rely upon the necessary truth, infallibility and certainty of some statements concerning one's own states of consciousness. The basis for the claim to truth and certainty of one's own states of consciousness is the notion that the apprehension of these states is independent and distinct from observation. One's own thoughts, dreams, and pains are directly evident and immediately present to consciousness, they claim, and this direct evidence is separate and distinct from the ordinary causal relations of observing other bodies.

You know that you think, and that you feel, directly and independently of the causal relations of the outside world. If there are other observers in the world, they do not have your thoughts or feelings, nor can they observe your thoughts or feelings. Only you have direct evidence of your consciousness.

However, it seems to me that this notion of direct evidence of one's own states of consciousness is misleading and incorrect. The notion is mistaken because, whether or not the truth conditions of claims to one's own states of consciousness are satisfied is determined by 1) the location of one's body in time and space, 2) the physical states of one's own body, and 3) the correspondence between stimulus and response in the experience. Awareness of one's own states of consciousness is observation, and these observations made are true or false by 1-3. A more accurate notion of direct evidence requires that the truth to claims of consciousness is regulated by Strawson's principle of identity.

Claims about one's own thoughts, intentions, sensations, dreams, memories or any other states of consciousness are just that – claims. Claims have a propositional form which establishes the truth conditions, or criteria, which must be satisfied in order for the claims to be true. The claims, “I believe x”, “I intend x”, “I hear x”, and “I remember x” are true if and only if the subject actually does believe, intend, hear and remember x. The claims must correspond to the actual world.

If we were never wrong about our own states of consciousness, then our awareness of these states might have a special status in relation to the truth of a claim. However, we are frequently wrong about what we see, feel, believe, dream, and remember. We observe the world around us, we observe ourselves in the world and many times we are wrong about both. Even with sensations as intimate as pain, the fact occurs that a person has a sensation, claims that the sensation is a specific pain, and be wrong. For example, cases in which an amputee claims to feel pain in a removed limb are common, as are cases in which a person having a heart attack claims to be having ordinary heartburn in the throat/chest area. Claims to sensation are not necessarily true, they need to be justified.

Any claim to the existence of p-properties is either true or not-true. Whether the conditions for sensing, feeling, remembering or intending are satisfied must be examined and determined. Even if we agree that certain claims of logic or mathematics are true without evidence or examples, claims to fact and existence in time and space must earn their truth by means of justification. Even claims to the existence and identity of one's own states of consciousness must be open to justification. The reason that such claims must be open to justification is simply that some such claims are true, some are false and there must be a way of telling the difference.

The process of justification is a series of steps taken to determine whether a claim is true or false. In order to justify claims about one's own states of consciousness, we need to identify our own

bodies in a unified framework of time and space in relation to other bodies in that framework. If I think I see a mouse run across the floor, or I think I hear a door slam, the process of justification requires further investigation, you have to locate your body amongst other bodies and collect evidence that a mouse actually did run across the floor or that a door did actually slam. If you are swimming in the ocean or sleeping in a tent in the wilderness, then you did not see a mouse, nor hear a door slam. There is no causal relation between a mouse, a door, and your ears and eyes. Consequently, in relation to one's own states of consciousness, if the causal relation between one's own body and another body does not exist, then either the state of consciousness does not exist or the causal relation was not correctly identified and the actual cause has another identity (e.g. the cause of one neural state is the complex morass of other states).

We are all familiar with the situation in which we think we think we hear, smell, or feel something, and are wrong. What makes the fact of mistaken sensation possible is that states of consciousness are identifiable and that they have causes that are identifiable. We are caught in the grip of causation and truth. Like statements about the rest of the world, statements about one's own states of consciousness are either true or false. If you think you smell a rat, and claim "I smell a rat", the statement is true, if and only if:

1. I really am the observer "I"
2. I really have the p-property of smelling a rat
3. There really is a rat
4. The rat really is the cause of the p-property.

To justify the statement requires that conditions 1, 2, 3 and 4 are satisfied. If conditions 1, 2, 3 and 4 are satisfied, then the proposition "I smell a rat" is true. Determining condition 1 and 3 requires locating two individual material bodies in a unified framework of time and space. Determining conditions 2 and 4 leads us into the traditional mind/body problem, about which, I believe, Darwin's Argument has implications. In order to determine 2 and 4, we need to identify p-properties, whether the observer has those properties, and whether the rat is the cause of those p-properties and how they fit into the causal chain?

In claiming that "The concept of a person is primitive.", Strawson relies on the special access of direct evidence. Hence, the ontological status of states of consciousness is determined by and dependent upon this immediate apprehension. I have tried to show that direct evidence is a type of

observation that it is fallible, and that it must conform to the same conditions of truth as other types of observation. Direct evidence is not necessarily true, it must be justified and shown to be true as with other observations. It can't carry the burden of Strawson's claim.

(C). Strawson argues that the concept of a person is primitive, made necessary, and must be assumed because of the logic of language and the direct evidence of consciousness. He maintains that m-properties and p-properties are different kinds of properties, and, consequently, that individuals to which both m-properties and p-properties are ascribed are different kinds of entities than those to which only m-properties are ascribed.

I think Strawson's claim about the ontological status of persons is mistaken. First, his use of his own principle of identity is inconsistent and second, this notion of persons is inconsistent with Darwin's T/E.

First, Strawson misrepresents the relation between properties and objects, and is inconsistent in that he correctly applies the principle of identity to m-properties, but does not correctly apply it to p-properties.

“Is it true that our idea of a peach is an idea of only a particular taste, color, size, consistency, and the like, and analogously that our ideas of such things as ships, trees, dogs, and houses are ideas only of the particular qualities or attributes that these things are commonly said to have? One is tempted to say instead that our idea of a peach is an idea of *something that has* a particular taste, color, figure, size and consistency; and analogously for the other familiar physical things. But even this is not quite right. Our idea of a peach is not an idea of something that *has* the particular qualities, say, of sweetness, roundness, and fuzziness. It is an idea of something that *is* sweet, round and fuzzy.

More pedantically, our idea of a peach is an idea of an individual x such that x is sweet, and x is round, and x is fuzzy. By thus using variables and adjectives, we express the fact that the object of our idea is not the set of qualities sweetness, roundness and fuzziness, but the concrete thing that *is* sweet, round and fuzzy. We also make clear what is essential to our idea of a peach, that the thing that is round is the *same* thing as the thing that is sweet and also the *same* thing as the thing that is fuzzy....

Our idea of “a mind” (if by "a mind" we mean as Hume usually does, a person or a self) is not an idea only of “particular perceptions.” It is not the idea of the perception of love or hate and the perception of cold or warmth, much less an idea of love or hate and of heat or cold. It is an idea of

that which loves or hates, and of that which feels cold or warm (and, of course, much more besides). That is to say, it is an idea of an x such that x loves or x hates and such that x feels cold and x feels warm, and so forth.”

(Rodrick Chisholm “Observability of the Self”
Philosophy and Phenomenological Research; p. 8-9)

This quote from Chisholm lays out a position that, I think, is true and helpful in revealing Strawson's mistake, which is the mistake of all dualism. Chisholm argues that the relation between an object and a property is one of numerical identity. An object is its properties; to identify an object is to identify at least some of its properties and to identify properties is to identify at least part of an object.

If the relation between properties and objects is one of numerical identity, and if the relation of numerical identity is transitive, then what's true of an object must also be true of its properties, and what's true of its properties must also be true of an object. If the yellow chair at the kitchen table is numerically identical to the chair we got from Aunt Hazel, and if the yellow chair is made of wood, then the chair we got from Aunt Hazel must be made of wood. If Sarah has the m-property of being the only person in the room, and if the only person in the room has the p-property of thinking about hamburgers, then Sarah is thinking about hamburgers.

If an individual is its properties, then the individual and its properties are transitive. The properties are part of the individual and the individual is partly those properties. To identify an individual is to identify certain properties and to identify certain properties is to identify an individual. If, in order to exist, an individual must be identifiable and re-identifiable in time and space, then the properties of the individual must also be identifiable and re-identifiable in time and space.

Strawson argues that a person is an individual that is identifiable and re-identifiable in time and space, and that individual has (is) both m-properties and p-properties. However, what is the ontological status of these properties? For any particular person, is it possible to distinguish an m-property from a p-property? Is it possible to distinguish one p-property from another p-property?

It's a fact that we ascribe p-properties to ourselves and to others. If Strawson's principle of identity is true, then a self must be identifiable as one individual amongst other individuals. If

Chisholm's claim is true: that an individual is numerically identical with its properties, then to identify some of the properties is to identify at least part of the individual. The issue at hand is how to understand the truth conditions of ascribing p-properties to individuals. Strawson argues that because of the logic of language, and because of the direct evidence of one's own states of consciousness, p-properties are identifiable. He also goes a step further and claims that individuals with both m-properties and p-properties are a different kind of individual than individuals with only m-properties. These individuals are called "persons" and their existence is primitive and must be assumed.

I have tried to show that Strawson fails to make his claim; even if the logic of language does entail existence, and even if direct evidence is sufficient to determine that p-properties exist, the fact that statements about one's own states of consciousness are sometimes false makes necessary a way to determine the existence of p-properties. To claim that "the concept of a person is primitive" does not provide such criteria, and, more seriously, it posits an entity that is inconsistent with Darwin's T/E.

Strawson makes the mistake of not applying his principle of identity to p-properties. If this principle were applied consistently to both p-properties and m-properties, we have to conclude that p-properties are not identifiable in time and space and that claims to their truth are indeterminate. We are left with the traditional problems of dualism: what is consciousness? What are p-properties? How do we identify them? Where do they fit in the causal chain?

One possible solution is to accept Strawson's argument that the concept of a person is simply primitive and that this concept is so deeply engrained in our lives and cultures that it must be assumed. This assumption implies that statements about any person's states of consciousness do have truth conditions, however, the process of determining whether the conditions are satisfied is obscure and otherworldly. Knowledge of states of mind, whether one's own or of others, is somehow the detection of something invisible.

The assumption of dualism, whether substance or property, is vastly common. Most people believe that the mind and body are distinct; that a conscious entity is a different kind of entity than one not conscious; that there are other worlds populated by innumerable, non-material objects of consciousness, like concepts, sensations, emotions, and spirits; and that this world of consciousness interacts in some way with the ordinary visible world of material bodies.

Another possible solution to these problems is the theory of materialism. Materialism takes the position that only material bodies exist and that all entities consist only of matter. To further

clarify what is meant by “material body” and “exist”, a materialism relevant to Darwin's T/E also claims that p-properties are numerically identical to m-properties; that states of consciousness do exist as parts of individuals; that thoughts, sensations, decisions and memories do exist but also that these states of consciousness are numerically identical to states of the body. The process of identifying states of consciousness, and where they fit in the causal chain, is the same as that of identifying material bodies: x exists if and only if x is identifiable and re-identifiable in time and space. Materialism accepts Strawson's principle of identity and uses that principle to reject his claim that the concept of a person is primitive.

My second objection to Strawson's claim about persons is that it is incompatible with Darwin's T/E. Although Strawson attempts an important and subtle explanation of human consciousness and the problem of mental causation, I believe it is adverse to Darwin's T/E. Strawson's claim that “the concept of a person is primitive” is incompatible with Darwin's T/E because the claim entails that persons are different kinds of entities than non-persons. For Strawson, m-properties and p-properties are different kinds of properties, and these different kinds of properties make different kinds of entities. Material bodies have (are) m-properties and are wholly identifiable and re-identifiable in time and space. Whereas persons have (are) both m-properties and p-properties and are only partially identifiable and re-identifiable - part of a person's ontological status is invisible and non-material. Strawson is a dualist.

The reason that Strawson's claim is incompatible with Darwin's T/E are:

1. “The concept of a person is primitive.” entails that after the beginning of life on earth, during a particular period of time and at a particular location of space, persons appeared suddenly as distinct from not-persons. Whatever constitutes p-predicates, Strawson's claim implies that at some time T, all organisms had only m-predicates, then suddenly at time T', at least one organism had m-predicates and p-predicates, making an entity with a different ontic status.

Darwin claimed that all parts of current organisms developed from some part of previous organisms. All parts developed gradually from previous parts and at no time did a new and different kind of part, or kind of organism, come into existence. Darwin maintained that the difference in mind or consciousness between very ancient organisms and current organisms (humans) "is one of degree, not of kind" (Descent, p.151).

2. “The concept of a person is primitive.” entails that only human beings have p-properties, and that other animals do not have p-properties. This claim is clearly incompatible with T/E. Darwin

claimed that many species of organisms have p-properties, and that the complex consciousness of human beings was developed gradually by changes to simple nervous systems, and passed on through innumerable generations over a vast period of time from the consciousness of very simple organisms. Consciousness was around long before humans came on the stage.

For these two reasons, Darwin's T/E and Strawson's theory of persons cannot both be true. Whereas the materialism previously discussed is compatible with Darwin, it is not compatible with Strawson. Ironically, Strawson's own principle of identity provides the conditions for eliminating his own explanation of human consciousness and mental causation. If T/E is true, the concept of a person is not primitive.

Summary of Darwin's principle of identity

I will further discuss Darwin's argument against dualism later in this review. However, for now, I need to summarize this vital philosophical assumption and see where it fits in to Darwin's Argument. Darwin argues that his T/E does explain facts and that his version of T/C does not explain facts. A fact is a state of affairs that exists. A theory is a set of general principles of which facts are instances. An explanation is the identification of the cause of a fact. The purpose of proposing a theory is to make a claim to truth about what is the cause of a fact; a theory claims that "x caused y". In order to determine the truth of a theory that "x caused y", it is necessary to identify "x", identify "y", and identify the relation of necessity between "x" and "y." The principle of identity is absolutely essential for determining what individuals can, and do, instantiate the general principles of any theory. To determine the identity of any "x" requires a set of criteria to identify "x", and distinguish "x" from "not-x."

The point at issue is to determine whether T/E and T/C use the same philosophical assumptions in their attempt to explain facts. In particular, does each apply the same principle of identity? I think so.

It's important to keep in mind that Darwin uses the terms "understand", "make intelligible", "comprehend", "account for", "accord with", and "explain" interchangeably. The very notion of rationality involves the process of understanding why a fact occurs. Explanation is the search for truth. In order to explain why a fact occurs, we must agree on some of the facts. In Origin, Darwin is very specific about the categories of facts for which he seeks explanation. Each of the facts refers to individual organisms and their relations with other individuals within their conditions of life. In order

to agree on what constitutes a fact, both the proponents of T/E and T/C must at least partially apply the same principle of identity.

The question that both parties ask is: why did the agreed upon facts occur? This question takes us to the point at issue – in order to explain a fact, we need to identify the cause of the fact. Both proponents must apply some principle of identity toward the cause.

Darwin proposes a fairly specific principle of identity. I have tried to show that Strawson's principle is compatible with Darwin yet is further developed and clearer. Consequently, I take the position that Strawson's principle of identity is appropriate, correct and should be used to determine the truth of Darwin's Argument. This principle should be used to identify the cause, the effect and the relation between cause and effect.

“...but unless it be specified whether order in time or space, or both, or what else is meant by the plan of the Creator, it seems to me that nothing is added to our knowledge...”

(Origin, p. 387, 6th.)

The proponent of a claim to causation must carry the burden of proof of identification. If existence is not identity in time or space or both, then what is it? What is it for god to be a cause? What is it to distinguish god from not-god, or one god from another god? Did god cause man's place in the universe – her intelligence, language, moral sentiment and religious experience?

Darwin faces these questions directly and answers with an explanation that is incompatible with divine causation.

“...some deeper bond is included in our classifications than mere resemblance. I believe that this is the case, and that community of descent – the one known *cause* of close similarity in organic beings – is the bond, which though observed by various degrees of modification, is partially revealed to us by our classifications.”

(Origin, p. 387, 6th)

Both T/E and T/C claim to identify the cause of facts. Darwin claims that descent from one or a few common ancestors is the only cause of his set of facts. If T/C claims either a different cause, or an additional cause, it is incumbent on its proponents to justify their claims and identify that cause.

In making his argument, Darwin assumes that T/C does use, and must use, the same principle of identity as T/E. If T/C uses a different principle, then it is the burden of T/C to justify the different principle. Consequently, without such a justification, it is correct to conclude that T/E and T/C assume the same principle of identity.

Assumption 6: Evidence

“The homological structure, embryological development, and rudimentary organs of a species remain to be considered, whether it be man or any other animal, to which our attention may be directed; but these great classes of facts afford, as it appears to me, ample and conclusive evidence in favor of the principle of gradual evolution.”

(Descent, p. 18)

“In the late eighteenth century, Jacques-Henri Bernardin de Saint-Pierre was an outspoken advocate of “natural theology”, the purpose of which is to find in nature evidence for the existence of God. For him, domestic animals were destined from their creation to provide meat and milk to mankind.”

(Evolution, De Panafieu and Gries, p. 394)

"Beyond a reasonable doubt, Jesus is alive."

(Billboard along Interstate 90 near Mitchell, South Dakota)

In the Origin, Darwin argues that T/E is true and T/C is false. In examining how he formulates his argument and whether he is successful, I have tried to parse out his underlying philosophical assumptions concerning logic, truth, knowledge, causation and identity. In order to evaluate the claims of the two theories, another crucial assumption needs focus: Darwin's principle of evidence.

Principle of evidence

The principle of identity that we just discussed is essential to the principle of evidence. If Strawson's principle of identity is correct and applied to Darwin's argument, then each individual organism that has existed, currently exists, or will exist, either had, has or will have a temporal and spatial relation to every other organism in a unified framework of time and space. Reality is a collection of individuals and relations between individuals, and some of those individuals are living organisms.

Part of the order of reality is that individuals have spatial (mass, volume, density, composition, gravity, magnetism) and temporal (velocity, past, present, future) relations with each other. Along with spatial and temporal relations between individuals, causation is another relation that is part of the structure of reality assumed by Darwin's argument. As discussed previously, causation is a relation between things that exist and is one of three kinds of necessity. The other forms of necessity, mathematical and logical, are wholly general and are true or false independent of existence or instantiation.

The necessity of causation is just as absolute and necessary as the necessity of the law of deduction in propositional logic. These formulas of causation are analogous to modus ponens:

1. (a) if x, then y
(b) x
(c) therefore, y

2. (a) if x, then not-y
(b) x
(c) therefore, not-y

3. (a) if not-x, then y
(b) not-x
(c) therefore, y

4. (a) if not-x, then not-y
(b) not-x
(c) therefore, not-y

For convenience, we can agree that 'x' and 'y' are instantiated either by individuals or events (facts) that are constructed of individuals. To say, "x exists" means either "x is an individual," or "x is an event constructed of individuals." Ultimately, whether facts or events are used to instantiate the formulas of causation, the principle of identity is still used to identify the individuals, and relations between individuals, that constitute the fact or event.

The negatives of causation are confusing and need more explanation. We need to understand that the concept of prevention, and the concept of absences, are a part of causation. To prevent an event can be part of causation, and the absence of a fact/event can be part of causation. To say "not-x is the case" does not mean that "not-x exists," it simply means either "there is no x", or that "x did not occur" is true.

The main difference between the formulas of propositional logic and the formulas of causation, is that with logic, the truth values of 'x', 'y', and 'if x, then y' are assigned. Whereas with causation, the truth values of 'x', 'y', and 'if x, then y' are discovered. This discovery of the truth value of the variable is the process of justification. Justification asks the questions: what is 'x'? What is 'y'? and what is the relation between 'x' and 'y'? Are 'x' and 'y' instances of the formulas of causation?

In order to discover the answers to these questions, justification uses and depends upon the principle of evidence. The principle of evidence provides the conditions that determine the existence of 'x' and 'y', and the truth of 1-4. What is Darwin's principle of evidence and what are its conditions?

A. Darwin's principle of evidence:

Evidence is a fact which is made necessary by an independent and separate fact, and is proposed for the purpose of identifying a necessary connection between separate facts.

This principle contains and relies upon certain conditions:

(a) Evidence has identity. Since the purpose of proposing evidence is to establish a relationship between facts, we must call upon a principle of identity. In order to determine whether 'x' and 'y' are instances of causal relations, each must be identifiable. To make this distinction between 'x' and '-x', Darwin's principle of identity requires that 'x' must be identifiable and re-identifiable in a unified framework of time and space. In order for a fingerprint to be evidence for the presence or absence of a person, there must be a fingerprint, and in order for there to be a fingerprint, there must be a distinction between what is a fingerprint and what is not a fingerprint, and a distinction between one

fingerprint and a different fingerprint. For one fact to stand as evidence for another fact, each must be distinguished from what it is not.

(b) Evidence is separate and independent. Since the purpose of providing evidence is to justify a relation between fact 'x' and fact 'y', 'x' and 'y' must be separate and distinct in time or space, or both, or, in the case of the discovery of numerical identity, the descriptions of 'x' and 'y' must be separate (e.g. the discovery that the planet Venus is both the morning star and the evening star). If 'x' and 'y', and the descriptions of 'x' and 'y', are numerically identical, then the claim that 'y' is evidence for 'x' is tautological and is a trivial restatement of the fact (e.g. "The fact that the gun went off is evidence for the fact that the gun went off" is tautological.)

(c) Evidence is logically consistent. The use of facts as evidence depends upon the laws of propositional logic. As discussed earlier in relation to Darwin's philosophical assumptions, with the laws of propositional logic, the truth of the premises is assumed, however, with the laws of causation the truth of the premises must be demonstrated.

For example, in order to determine the truth of the general causal proposition "For any fact x and any fact y, x causes y," the Laws of Identity ("x is x"), Excluded Middle ("x is either x or not-x") and Non-contradiction ("x is not not-x") must apply to each 'x' and each 'y' because we are claiming that 'x' and 'y' exist and are instances of a general proposition (the case of not existing or not being an instance needs to be addressed, but it doesn't change the principle of evidence). The hard part comes with determining whether the instance of 'x' does in fact cause the instance of 'y'.

To say that the principle of evidence is based upon logical consistency means that, if the general statement "x causes y" is true, then it is true for every x and every y. The process of determining the truth of the general statement requires the process of providing examples and counterexamples as instances. The reason that examples and counterexamples are so effective at determining the truth of the general proposition is that, at its very heart, causation is logically necessary. If causation were not logically necessary, there would be insufficient reason and force behind examples and counterexamples.

For any general claim "x caused y", if everyone agrees on the identities of 'x' and 'y', and on the causal relation between 'x' and 'y', then there may be no need for justification. However, if there is a dispute concerning the identities of 'x' and 'y' and their relations, if one person claims "x caused y' is not true," then the process of justification is necessary. According to Darwin, the principles of evidence are rules of justification that discover truth and settle disputes. These rules are followed, and

must be followed, in order to discover the identity of facts and the relation between these facts. Evidence is the link between truth and understanding.

If 'x' and 'y' are claims to fact, and if “x caused y” is a claim to fact, then the process of justification requires evidence showing that 'x' and 'y' are indeed facts and that “x caused y” is indeed true. Claims to evidence must also meet certain conditions: evidence has identity, evidence is separate from the fact for which it is evidence, and evidence is logically consistent with that for which it is evidence. When evidence is submitted in a dispute, both parties must examine the evidence and determine if these conditions are satisfied.

The first part of the process of justification requires the provision of evidence that 'x' and 'y' are indeed facts. In his books on evolution, Darwin provides a multitude of facts which serve as instances of 'y' for both T/E and T/C – his list of facts concerning geology, geography, homology, embryology and remnants/rudiments. The next requirement of justification is to provide evidence that identifies both 'x' and the relation between 'x' and 'y'.

As expressed previously, there are many different relations between facts and the parts within facts: location in time and space, magnetic forces, electrical charges, size, volume, velocity, distance, etc. The relation that interested Darwin when he developed the argument between T/E and T/C was the relation of causation. In their most basic forms, T/E claims that facts 'y' are caused by the facts and principles of descent, while T/C claims that facts 'y' are caused by the facts of god. Throughout the development of his argument, Darwin clearly maintains a fundamental incompatibility between T/E and T/C. The loci of incompatibility are the instances of causation. In order to evaluate the success and implications of Darwin's argument we need to further examine causation and the relation between causation and evidence.

It's important to keep in mind that the relation of causation between cause and effect is not itself an object, it is a relation between objects. For any causal chain of events, the individuals that constitute the event of the cause, and the event of the effect, must be identifiable. However, the relation between the event of the cause and the event of the effect is not itself an individual, it is a relation between individuals. You see the things, but you don't see the causation.

It is also essential that the relation of causation be necessary. If it's true that “x caused y,” then for any 'x' and any 'y' the relation cannot be the otherwise, and the relation obtains without exception. When we say, “x causes y,” we mean that if 'x' occurs, then 'y' must follow; without exception and it cannot be otherwise.

It is this necessity of causation that makes evidence possible. One fact can stand as evidence for another fact only if the relation of causation is necessary. This necessity provides the reason that tests, predictions and the consistency between facts count for or against the truth of claims to causation. Our concepts of understanding, explanation, and evidence are based upon the necessary connection between cause and effect, that a specific effect must follow a specific cause without exception, and cannot be otherwise.

If the relation between cause and effect were not necessary but only probable, then no test results, nor predictions, nor consistency could be incompatible with different results. If only probable, there could be no way to distinguish an example from a counterexample. For example, if only probable, then, in exactly similar conditions, sometimes “x causes y at time t” would be true and sometimes “x causes y at time t” would be false. If the relation between Linda's holding a gun, and Linda's fingerprint on that gun, were only probable (that is, if sometimes Linda's fingerprint were on the gun even though she didn't hold it, or, if under exactly similar conditions, sometimes there is a fingerprint and sometimes there is no fingerprint), then the fact of Linda's fingerprint showing up on the gun would be irrelevant or unrelated to the fact of that gun being used to kill Keith. If the relation between Linda and Linda's fingerprint were only probable, then anybody's fingerprint could show up on any thing, at any time.

Also, if only probable, there could be no way to distinguish accidental regularity from causal regularity. The reason some parts of a causal event are relevant to some parts of an effectual event, is the necessity between those parts. For example, if Linda shot Keith at time t, and Keith's blood spills on the floor at t', the fact that there was a speck of dust in the corner of the room at both t and t' is irrelevant to the blood on the floor, whereas the fact of Linda's pulling the trigger is relevant to the blood on the floor. The reason for relevance is the necessity, not the probability, between pulling the trigger and the gun firing. What makes one contiguous fact or event relevant, and another contiguous fact or event irrelevant, is the relation of necessity between those facts or events.

The fact that only some parts of an event are relevant in the causal chain sets the stage for the traditional problem of induction: the only observable relations between the event of the cause and the event of the effect are those of contiguity, priority in time, and regularity (or constant conjunction) between parts, and that there is no way to distinguish between accidental regularity and causal necessity. The problem of induction further implies that even tests which add or subtract different parts of causal events also only yield results that provide no way of distinguishing between accidental

regularity and causal necessity. Thus, causal relations between events are reducible to the experienced repetition of one event following another.

The attempt to solve the problem of induction has led to two fundamentally opposing positions that are essential to understanding Darwin's Argument: causal idealism and causal realism. Causal idealism claims that causal necessity is strictly conceptual and located in the observer. The identity of general causal laws, and individual causal relations, is determined solely by the observer's interpretation of experience. The truth of any statement "x caused y" is determined by the consensus of observers, and the consensus of observers is determined by the number of instances of regularity. With causal idealism the relation between cause and effect consists wholly of a human conceptual framework constructed of language, custom and culture. The necessity of causation is located in human experience and is dependent upon how conceptualization organizes and interprets experience.

Causal realism claims that causation is a relation of necessity between events which obtains independently of human experience and interpretation. General causal laws are laws of nature, and as such are given parts of the structure of reality that have determined the events of history through all time. Specific causal relations are the actual, existing instances of general laws. These laws and relations force the occurrence of events independently of how human conceptualization organizes these events. Causal relations always have direction in time with the cause preceding the effect, and a causal law with only one instance is equally determined and necessary as a causal law with a billion instances. Causal laws and relations precede human experience, and knowledge of them is a matter of discovery.

Causal idealism and causal realism are very different theories and whether one best explains the world in which we find ourselves will have significant implications on our deepest beliefs and values. Each position has advantages and disadvantages that affect our understanding of ourselves and our place in the world.

This issue of the location of causation – in our minds or in the world – is crucial in evaluating Darwin's Argument. In order to compare and evaluate T/E and T/C, both proposals must share fundamental assumptions. I have tried to show that each theory assumes the principles of logic, truth, knowledge and identity. If T/E and T/C don't share the same concept of causation, the comparison of the two would be idle and academic. Claims to truth and explanations of fact would have to be evaluated with different criteria.

It's clear that Darwin was a causal realist:

“...there is a striking parallelism in the laws of life throughout time and space; the laws governing the succession of forms in past times being nearly the same as those governing at the present time...”

(Origin, p. 384, 6th)

“It is a truly wonderful fact – the wonder of which we are apt to overlook from familiarity – that all plants and all animals throughout all time and space should be related to each other, in groups subordinate to groups, in the manner which we everywhere behold...”

(Origin, p. 129, 6th)

Darwin's T/E thoroughly depends upon and assumes that throughout all time and all space, all plants and all animals are instances of general causal laws. The necessity of causation is rigid and final, instances of causation could not have been otherwise, and there are no exceptions. This necessity of causation is the foundation and necessary condition of Darwin's principle of evidence.

The Origin is stuffed with examples of evidence in support of T/E and counterexamples of evidence in opposition to T/C. This evidence takes three forms: tests, predictions and convergence with separate facts. The reason that fact A *can* be evidence for fact B is not that A makes B more or less probable, rather, it is that A makes B necessary. When a coyote walks on fresh snow, it leaves a track in the snow. The coyote and the track are separate and independent facts located in time and space; at one time, the coyote and the track were contiguous, and the existence of the coyote preceded the existence of the track. The relation between the coyote and the track is one of necessity: given the conditions of the facts, the track followed the coyote without exception and could not have been otherwise. In order for the counterexample to be true, for example, “The coyote did not make a track.”, or “There is no track.”, some conditions of the facts had to be otherwise (e.g. wind, sun, hardness of snow, etc.).

In order to understand the difference between necessity and probability, we need to distinguish between a fact, and knowledge of a fact. A fact is a state of affairs that exists, and knowledge of a fact is a conceptual/psychological relation between a fact, observation and proposition. A fact about events of the world did occur, does occur, or will occur independently of human conception or observation; the tree did fall, is falling, or will fall independently of what humans think or see. Facts were facts before humans existed, and facts will be facts after humans are

gone. Knowledge of facts, on the other hand, occurs in the brain, is somehow related to observation, and is somehow recorded in language. Whether a fact is known is conditioned upon a brain event, an experience event, and a language event.

The issue at hand in evaluating Darwin's Argument is whether the causal relation between one fact and a separate fact, is one of probability or necessity, and how each of these positions would affect Darwin's principle of evidence. As a causal realist, Darwin maintains that general causal principles are the given and fundamental structure of reality; that facts are instances of those principles; that, as instances, the causal relation between facts is necessary, cannot be otherwise, and are without exception.

It is essential to Darwin's Argument that the relation of causation between existing events is as necessary as the relation of deduction in a modus ponens argument of propositional logic, and the addition and subtraction of numbers in arithmetic.

Some reasons which justify the claim that causation is necessary are:

1. tests do work (throwing dust in the air will sometimes show which way the wind is blowing)
2. predictions do work (the green chair at the kitchen table will still be green tomorrow)
3. some facts do explain separate facts (walking in the rain made my hair wet)

The fact that these reasons obtain cannot be explained by claiming that the causal relation is simply assumed, learned by induction from experience, nor learned by language. To make such a claim about assumption or learning is circular, and is itself an assumption that the relation of causation (“assumption is the cause” or “learning is the cause”) is necessary. The claim that the necessity of causation is just in your head (by assumption, by induction from experience, by learning language) is wrong because that claim must assume that assumption, induction, and language are causes, and that these events make necessary (cause) the stuff in your head.

Another reason which justifies the claim to the necessity of causation is the effectiveness of counterexamples.

4. For any claim “under conditions z, x causes y”, if, under z, x occurs but y does not occur, then the burden of proof is laid upon the proponent to show either z is really not-z, x is really not-x, or y is really not-y. If the identities of x, y and z remain, then the fact that y did not occur is a counterexample to the claim.

If causation is not necessary, then violations to claim "x causes y" would have no weight against the claim. Without necessity, counterexamples would have no grounds. However, in reality, counterexamples definitely do work, and are fundamental to arguments concerning causation.

Finally, another reason which justifies the claim that causation is necessary is the nature of probability.

5. If causation were just probable, that is, if the relation between cause x and effect y were a matter of 'more or less likely to occur', then the more often y followed x, it would become less likely that y would continue to follow x.

If causation were just a matter of probability, and if event y follows event x at time t, then the probability of y following x at t^1 is 50/50 (with a higher number on the left indicating more likely and a lower number on the right indicating less likely). Each time y follows x the balance changes, if y again follows x at t^2 then the balance is 51/49. If y follows x at t^3 then the balance is 52/48, and so on, with regularity until the balance is 99/1. A necessary condition of probability is that there is no such thing as 100/0, it must always remain possible that y not follow x. With probability, the more often y follows x, it becomes more likely that sometime down the line, y will not follow x. Consequently, if the relation of causation were merely probable, then the more often a test yielded the same result, that is, the more often a prediction is correct, the more often one fact is related to a separate fact, then the less likely it would happen again.

Darwin's principle of evidence depends upon this necessity of causation. In order for one fact to be evidence for the occurrence of a separate fact, the relation of causation between facts must be necessary, could not be otherwise, and is without exception. If the causal relation between fact x and fact y were random, accidental, probable or based solely on regularity, then the occurrence of y would not be evidence for the occurrence of x. In order for x to be evidence for y, there must be a way to distinguish facts which are regular but irrelevant from facts which are regular but causal. Regularity is definitely helpful in identifying causal events, but cannot itself be the grounds for the distinction.

The ways we distinguish regularity from causation are: testing, making predictions and evaluating the relations between different kinds of facts (convergence and consilience). If the basic formula of causation is "x caused y," then a test is a controlled state of affairs in which instances of 'x's and 'not-x's, 'y's and 'not-y's, are plugged into the formula. A prediction is a claim that if one of

the formulas of causation is true, and if the cause did, does or will occur, then the effect did, does or will occur. The convergence of facts is the expansion of the formulas of causation such that the numerically identical cause has very different kinds of effects, expressed in the formula “x caused y + a.” If different kinds of facts are conjoined, tests and predictions can show that they have the same cause. If it can be shown that 'x' caused 'a', and if it can be shown that 'a' and 'y' have a special similarity, then that fact can be evidence that it is also true that 'x caused y'.

A realist theory of causation claims that general causal laws are part of the given structure of reality, and that the claims of instantiation, are either true or false. For any statement of a causal relation, it's not the regularity nor probability that makes the statement true, it's the instantiation of a true general principle that makes the statement true. When a true general principle is correctly instantiated, the consequent states of affairs are necessary. It's the necessity between instances that makes evidence possible. The results of tests, predictions and convergence of facts are evidence because the effects which are identified are forced to occur, cannot be otherwise and are without exception. As evidence mounts, truth becomes evident, and as truth becomes evident, belief becomes knowledge. There are grey areas between evidence, truth and knowledge, but those areas of uncertainty do not imply that truths cannot be known, nor that evidence cannot reveal truth.

The hard part about causation is actually identifying the cause of an effect. As stated earlier, if everyone believes that “x caused y” is true, then we have no problems. However, when people make claims about causation that are incompatible, and those claims affect each other's lives, then we have a problem - incompatible claims cannot both be true.

The necessity of causation guarantees that evidence is possible; that the occurrence of one factual event *can* identify the occurrence of a separate factual event. Darwin's principle of evidence provides the conditions that *do* identify the cause of an event. Tests, predictions and convergence can, and sometimes *do*, identify causes.

Claims to causation are claims to truth, and each claim carries a burden of proof. This burden requires that the proponents provide evidence that what is claimed to be the cause, is indeed the cause.

“.....We have no evidence of the appearance, or at least of the continued procreation, under nature, of abrupt modifications of structure.....On the other hand, we have abundant evidence of the constant occurrence under nature of slight individual differences of the most diversified kinds; and we are thus

led to conclude that species have generally originated by Natural Selection of extremely slight differences.”

(Variation II, p.356)

According to Darwin, evidence is a fact which identifies a causal relation between separate facts. Tests, predictions, and the convergence of facts provide evidence. These facts of evidence provide various degrees of thoroughness and accuracy toward satisfying the burden of proof. Some facts provide evidence for the truth of claims to causation.

Legal theory has established standards of evidence used to identify facts, and the causes of facts, in relation to the laws of society. Judges and juries make decisions about “who done it” by evaluating evidence and determining the truth of the claim “x caused y.” The evidence provided by the prosecution of guilt, and by the defense of innocence, have different levels of strength in support or opposition to the claim. Although grounded upon the assumption of the necessity of causation, these levels of strength are expressed in terms of the probability of identifying a cause.

1. Insufficient evidence

– The evidence provided is either not a fact or does not provide a reason or way to distinguish one cause from another cause

2. Preponderance of evidence

– more likely to be the cause than not be the cause, better than 50/50 chance

3. Clear and convincing evidence

– high on the scale of probability – 75/25 chances of being true that x caused y

4. Evidence beyond a reasonable doubt

- "Proof beyond a reasonable doubt is proof of such convincing character that reasonable person would rely and act upon it in the most important of his or her own affairs.”

(10/2014 Jury instructions in Sweet Grass County District Court, Big Timber, MT)

It's hard to overestimate the importance of evidence. These same standards are used, and, I think, must be used, in the theorization of any kind: legal, scientific, religious, and every part of everyday life in which causation is assigned; in which causes and effects are identified; where facts call for explanation; and where explanation calls for truth. Although different disciplines of study, different cultures, and the ordinary lives of different individuals, have greater and lesser degrees of detail in formulating the rules of evidence, all evidence consists of tests, predictions and convergence of facts. To provide evidence is the sole method of justification for claims of causation.

This concludes my review of Darwin's philosophical assumptions. He was one man that lived for seventy-three years, and in a specific historical context. Although a world traveler and keen observer, no one sees everything, nor knows everything, nor can escape the web of philosophical assumptions that constitute the background of experience and culture. However, we do talk and write, we do make claims about ourselves and the world, and some claims are in conflict. Darwin used the English language to make vast claims about the history of life on earth. I have tried to parse out Darwin's assumptions concerning these issues: logic, truth, knowledge, identity, causation and evidence; and show how each assumption significantly influences the content and validity of his argument.

Each of these assumptions introduces broad and profound issues in the history of philosophy, and each remains, to this day, controversial and open to debate. However, life is short and each of us has a limited amount of time to understand and make up our minds. Whether T/E or T/C are true, makes a huge difference in the understanding of your own life, and the lives of your friends and family. Darwin made assumptions, and his "one long argument" thoroughly depends upon these assumptions. Your decisions about the truth and validity of DA will also rely on these assumptions.

What are the options for judging Darwin's Argument?

A. T/E and T/C do not share the same philosophical assumptions about one or more of these issues: logic, truth, knowledge, identity, causation or evidence.

B. T/E and T/C do share the same philosophical assumptions about these issues: logic, truth, knowledge, identity, causation and evidence.

Option 1. T/E and T/C are both false

Option 2. T/C is true, and T/E is false

Option 3. T/E is true, and T/C is false

Option 4. T/E and T/C are both true

A. T/E and T/C do not share philosophical assumptions.

The publication of Origin in 1859 was immediately met with a firestorm of controversy. The first edition sold out the day it was published. During Darwin's lifetime, virulent debates filled lecture halls of universities and editorial pages of newspapers. The fight between T/E and T/C began immediately within schools, churches, and courts, and continues to this day. Many cultures, countries, and their governments, have strict laws regulating the advocates of each theory. In the United States, the battle between T/E and T/C rages daily, particularly for the minds of children in public schools, and the votes of adults in many local, state, and national elections. In an alarming statistic determined by Gallup and Pew polling between 1982 and 2005, between 60% and 80% of Americans accept T/C and reject T/E. (The Reluctant Mr. Darwin, by David Quammen, p.15)

Why the long battle between T/E and T/C? Granted, the history of science is full of controversy and persecution. Proponents of gravity as the cause of tides, germs as the cause of disease, and parts of the brain as the cause of dementia, have been ridiculed, thrown in jail, and burnt at the stake. In all aspects of our lives we try to identify causes of facts, and when causes are identified that conflict with cherished beliefs, a seemingly natural reaction of human beings is to punish the messenger. However, no matter how large nor agitated the mob which seizes the proponent of a conflicting explanation, everybody knows that the real culprit is untruth. When sets of beliefs are in conflict, people take sides - everyone thinks they're right, and the other guy is wrong.

The whole notion of taking sides, of having convictions, is based on our concept of truth. Whatever statement "x" you choose, if you believe that "x" is true then you will also believe that "not-x" is false, and you will believe that "Either x, or not-x", but not both.

The fact that intense controversy still surrounds the comparison between T/E and T/C is evidence that the proponents of each theory make the same philosophical assumptions. If the subject of each of those theories were the speed of light, or the size of black holes, or different causes of cancer, then the strongly held convictions would disappear into professional journals, laboratories, and the lecture halls of our universities. The reason Darwin's Argument remains so controversial amongst all groups of citizens is that the subject of each theory is deeply individual and personal; the subject is you and me, your parents and my parents, your children and my children. Who are we?

Where did we come from? Where are we going? What is the meaning of life? What is the truth, and how do we know it?

To make the same assumptions implies that all people live in the same world, share the same facts, and what's true for me is also true for you. Everybody knows that something big is at stake in the discussion. The fact of disagreement is at least evidence that we are talking about the same thing - to identify the specific cause of specific facts. One theory says “x”, and one theory says “not-x”. If the proponents of T/E and T/C do not share assumptions, then the passions of the dispute are misdirected and arbitrary, and the blood spilled in the fight is wasted.

Also, we can put the burden on Darwin's understanding of his own argument; he was a fair and responsible thinker, world traveler, and keen observer of human culture and the natural world. He was himself a studied and sincere proponent of T/C until his gradual rejection. Many times, he states that the claims of T/C would be “fatal to my theory”. The fact that Darwin said so, is good evidence that the proponents of T/C and T/E share the same philosophical assumptions.

B. If T/C and T/E share the same philosophical assumptions, what are the options?

Option 1: T/C and T/E are both false.

Since the Origin was published, all the fields of the biological sciences - anatomy, morphology, biology, biophysics, genetics, medicine, and on - have developed new technologies and collected many facts concerning human beings and our place in the world. Biophysics and genetics, in particular, have focused on the particles and laws of inheritance, variation and modification of living things. The search for facts, and the causes of facts, has led us deeper and deeper into the living cell. So far, tests, predictions and convergence of facts confirm that current organisms are indeed instances of the general principles of T/E. If causation is necessary, and not just probable, then each instance of confirmation makes it less likely that the theory will be overturned.

As for truth, the challenge to T/E does not come from T/C, it more likely comes from the discoveries of biophysics and genetics. The remarkable advances in microscopes and computers, the brilliant research of molecular phylogeny, and the consequent genetic sequencing, horizontal gene transfer, and infectious heredity (see David Quammen's, The Tangled Tree: A Radical New History of Life), all put Darwin's T/E to test. Each year we learn more about the identity, structure, origins, and relations of genetic materials. Theories of evolution, with new and adjusted principles, are being

proposed and evaluated. It may be that Darwin's insistence on gradual modification, resistance to sudden changes in parts, and his strong commitment to parent to offspring inheritance, will be proven wrong. I don't know, but I don't think so.

Whatever the discoveries concerning the original particles of life on earth - what they were, how they formed, how they developed into more complex organisms - the proponents of new theories will also be committed to a set of philosophical assumptions. Those scientists that seek to challenge Darwin's T/E must either adopt his assumptions or, if not, justify their different assumptions. Whereas phylogenetics may show that there were three forms of early organisms (bacteria, eukarya, archaea) rather than two forms (prokaryotes, eukaryotes), and whereas evidence may show that parts of the genetic sequence of early organisms, and even the genetic sequence of current organisms (e.g. human beings), are suddenly changed by the invasion of bacteria and viruses, those experiments and those hypotheses are limited by Darwin's assumptions. Whatever the parts, and whatever the cause of parts, challenges to Darwin are restricted by the conditions of identity and causation.

As with any T/E and with any T/C, each theory is "just a theory". A hallmark of science, and perhaps any claim to causation, is that theories are not tautological. They are confirmed by evidence, and are always subject to counterexamples. As we probe deep space, we may yet uncover an ultimate randomness, a supreme super-agent, or multiple universes, that better explain facts than current attempts. If both science and religion are theories, then each must remain open minded and subject to evidence. The truth of a theory is not a matter of the certainty of the believer, nor of how many people are on your side. Claims to truth need evidence.

The option that both T/E and T/C are false remains open. Yet, the discovery of each intermediate dinosaur fossil, each forensic DNA test that overturns the conviction of an innocent inmate, and each antibiotic resistant form of bacteria, makes the case for T/E stronger, and the case for T/C weaker. There are major objective differences in the amount of evidence for truth, and success in explanation, between T/E and T/C, and this would not be the case if both were false.

Option 2: T/C is true, and T/E is false.

Although most familiar with Christianity, Darwin describes T/C in terms sufficiently general to accommodate all world religions, and all expressions of spirituality, that relate to his sets of facts. The many instances of the general principles of T/C - supernatural power, mysterious cause, sudden change and authority - vary considerably from case to case, but the necessary condition of T/C is

some kind of dualism which claims that one or more supernatural forces cause certain facts about human beings. Throughout the history of religion, different groups of believers have provided evidence to justify their claims that god(s) caused facts. The evidence provided by T/C consists of:

- a. holy texts and stories
- b. prophecies
- c. miracles
- d. religious experience
- e. intelligent design

As previously explained, Darwin's principle of evidence defines evidence as a fact which identifies a necessary relation between independent and separate facts. The reason one fact can stand as evidence for a separate fact is that both events are part of a causal chain that is necessary, cannot be otherwise, and is without exception. Evidence is proposed in order to identify a causal relation between separate facts.

According to Darwin's Argument, both T/C and T/E claim that "x caused y" is true, and each theory has the burden of showing the truth of these claims: "x is a fact", "y is a fact" and "x caused y is a fact". These three sets of facts constitute the conditions of truth for each theory.

T/C attempts to satisfy these conditions by proposing a-e as evidence. Proponents claim that each chosen a-e is causally related to the truth of a general claim: "x caused y" in which "x" is instantiated by a chosen god/spirit/force, and "y" is instantiated by any specific a-e.

The proponents of both T/C and T/E can agree that, during human history there have been many y's, and that many a-e's have occurred: holy texts abound, true prophecies have been made, mysterious and amazing events defy explanation, many people claim to feel the presence of god, and the relations between living things are complex, well ordered, and seem to be designed. However, the identity of "x", and the truth of "x caused y", is at issue.

In order for the current option to obtain, that is, if T/C is true and T/E is false, then, for any specific factual event that is relevant to the case, T/C has the burden of showing that (1) god is the cause of the fact and (2) the principles of T/E are not the cause(s) of the fact. In order to satisfy this burden, proponents of T/C must, in principle at least, be able to provide evidence to support their claim. Any specific a-e that is offered as evidence for god's causation must be tested, used to make

predictions and converge with separate facts. In order to serve as evidence in other cases, proponents of T/C must demonstrate that god is indeed part of the cause of a-e.

But how can it be demonstrated that god is part of the cause of any specific a-e? How can any a-e be used as evidence of god's causation unless it be shown that god is part of the causal chain?

Believers have two ways to demonstrate that god is part of the cause of a fact:

(1) identify god as a sufficient condition by making predictions such that “if god is the cause, then "fact y" will occur”.

(2) identify god as a necessary condition such that "'fact y" would occur only if god is/was the cause.'

Any person that has participated in any a-e has the burden to demonstrate (1) or (2). For any a-e to serve as evidence for T/C's main claim “god causes some facts,” proponents must satisfy (1) or (2).

The critics of T/C are at a disadvantage because, first, holy texts and traditional stories were developed a long time ago; and second, many of the claims of T/C are about life after death, the creation of everything, and the end of everything. The criteria for determining the truth of these claims about the distant past and distant future can't be applied because the subjects are not available for review. Some will claim that these difficulties leave T/C off the hook (e.g., Philosophy of Religion by John Hicks, Prentice Hall), that the jury is out, and that nobody knows whether verification of the claims of T/C will occur in the future (judgement day, Jesus' return, etc.). Concerning these questions of life, death, and meaning, most religions call for a “leap of faith” and offer a non-detectable dualism that makes claims about 'x', and 'not-x', but offer no criteria with which to distinguish 'x' from 'not-x'. Although different religions and spiritualities make claims that are incompatible, they also claim that, at least for now, the truth of specific basic claims is unknowable and unavailable. Faith offers a utilitarian criteria of truth that sorts out our beliefs, not according to a realist principle of identify, a realist theory of knowledge, nor a correspondence theory of truth, but rather according to what makes sense, what feels good, and what accords with a community of shared beliefs.

However, for this part of the analysis of Darwin's Argument, we have agreed that T/C and T/E share assumptions, and that the truth of each must be evaluated with these assumptions. It seems that T/C is propositional, and does make claims about the events and objects within the framework of time and space. Whereas in our everyday lives we make claims about yesterday, today, and tomorrow,

and have criteria for determining whether these claims are true or false, and whereas we have agreed to use these identical criteria in evaluating the claims of T/C and T/E, we need to determine what conditions need to be met in order to satisfy the option that T/C is true, and T/E is false.

Darwin chose the facts, and both T/C and T/E claim to identify the cause of these facts. T/C is using propositional logic, and is claiming that “god caused some facts” is true. According to the Law of the Excluded Middle, the statement “god caused some facts” is either true, false, or it is not a statement of fact, i.e. it has no content, has no meaning. Proponents of T/C definitely believe that their claims are meaningful, have content, and are true about the world. If there are no criteria for distinguishing truth, then every statement of every a-e is true, that is, god causes every event that anyone says god causes, and that every religion is true; Jesus died for your sins, and Jesus did not die for your sins; cows are human souls, and cows are not human souls; Mecca is holy, and Mecca is not holy; god is on our side, and god is not on our side; god is one, and god is three, and god is many; god created woman from a man's rib, and mother earth had two babies – one a girl and one a boy. If there are no criteria for determining the truth, then each statement is true.

In order to prevent T/C from dissolving into absurdity, there must be criteria for distinguishing truth. There must be a way to identify god and determine whether god is the cause of a fact. Since we have agreed that T/C and T/E have the same assumptions, T/C carries the burden of proof and must provide evidence that god is distinguishable from not-god, that god is identifiable, that god is a cause, that god is knowable, and that specific statements in any a-e are true. Evidence is all important and the burden is on the proponent, not the opponent.

For option 2, the second part of T/C's duty is to show that T/E is false. This obligation is a very heavy lift. One way to proceed would be to examine each of Darwin's classes of facts (geography, geology, embryology, morphology and rudiment/remnant) and each of his principles (reproduction, inheritance, variation, natural selection and modification) and show that his tests, predictions and comparison of facts yielded data that was insufficient for his conclusions. Unfortunately for T/C, over 150 years of observations do yield many examples in support of T/E, and each observation would need to be overthrown.

A second way to proceed would be to collect a set of facts that cannot be explained by T/E, facts about the history of living organisms that do not conform to the principles of T/E. The proponents of T/C must then show that god's causation or god's plan is the only, or most reasonable, explanation for the counter-example. This alternative is not quite so difficult and one can at least

imagine a way out. For example, if a fully formed human skeleton was discovered in a Cambrian layer of sedimentary rock, or if discoveries in the microphysics of genetic transfer, or the macrophysics of the far reaches of the universe are simply unexplainable without the introduction of a supernatural cause, then an act of god seems to be reasonable. However, someone will eventually disagree and the proponent of one non-detectable cause will be challenged by someone claiming a different cause, or multiple non-detectable causes, and we're back where we started – distinguishing 'x' from 'not-x'. These potential counter-examples are very subtle and theoretical, but they do give hope to some proponents of T/C.

Consequently, we are full circle back to evidence. If T/C and T/E are each “just theories”, and both share assumptions, in order for Option 2 to obtain, T/C must provide evidence that god is the cause of some facts, and evidence that T/E is not the cause of those same facts. The connection to truth is in the evidence, and the burden is on the proponents of T/C.

Option 3. T/E is true, and T/C is false.

This is the option that Darwin himself proposed and defended. He collected many facts about living things and their conditions of life; conducted tests and recorded data; made predictions about future discoveries and relations of independent sets of facts; and formulated specific general principles that sought to explain how/why facts occurred by identifying the causes of facts. Upon formulating these principles, then collecting more facts and making more predictions, with sincere modesty and full transparency, he proposed T/E and challenged all thinkers to show that he was wrong. Innumerable subsequent discoveries and predictions concerning each of his principles have provided evidence which supports his theory: each and every living thing on earth, through all time, and without exception, has descended from one or a few common ancestors.

In order for Option 3 to obtain, if T/E is indeed true and if T/C is indeed false, then, for certain facts that are relevant to the case, T/E's argument has two prongs, one positive and one negative. For that particular fact, it must be the case that:

- (1) the principles of T/E are the causes of the fact and
- (2) god is not the cause of the fact.

These are separate parts of the argument and Darwin consciously and thoroughly addresses each part.

Because of his fearless commitment to truth, Darwin did a lot of critical thinking for his opponents - he critically evaluated his own theory, and honestly sought to expose its weaknesses The

first edition of Origin includes Chapter VI, “Difficulties of the Theory”, and subsequent editions add Chapter VII, “Miscellaneous Objections to the Theory”. In Chapter VII, he had grave doubts that some facts concerning the inheritance of instincts, sterility between species, and natural selection of neuter insects were counterexamples to his principles. In Chapter VII, he argues that progress is not necessary; that natural selection can cause retrogression rather than progression; and that parts of the offspring are strictly limited to parts of the parent. His response to his critics was in-depth and he examined possible states of affairs that, if they were facts, would be “fatal to my theory.”

“If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down. But I can find no such case.”

(Origin, p. 191, 1st)

This quote reveals part of the structure of Darwin's Argument. He does not argue that T/E explains all facts about living organisms. Some facts have causes that are irrelevant and separate from the principles of T/E, e.g., the law of correlation of growth (heavy antlers in elk cause larger neck muscles), the law of use and disuse (cave animals go blind), the changes in conditions of life that cause extinction (large volcanic eruptions cause changes in weather which cause some organisms to die off). However, for the five classes of facts that he identifies, Darwin admits no exception; certain facts about individuals were caused by descent, and not by any other cause.

In order to demonstrate (1) and (2), Darwin relies on very specific philosophical assumptions, and the arduous process of example and counter-example. Using assumptions (logic, truth, knowledge, causation, identity and evidence), he identifies causal principles (ordinary generation, inheritance, variation, natural selection and modification) of which facts (geology, geography, morphology, embryology, rudiments) are instances. Tests, predictions, and convergence with separate facts, provide evidence which supports or opposes the truth of the general principles. Darwin demonstrates (1) by providing evidence that these principles of T/E do indeed cause facts.

In identifying possible counter-examples that would “annihilate my theory” Darwin focuses on counter-examples to T/E, that is, any special acts of creation that could not be caused by the principles of descent. He argues against the principle of utility, the principle of intelligent design, and

any other plan of creation (Origin, p. 200 and 458, 1st). Each of these principles, plans, and events that are “meant to be”, fit under the basic claim of T/C, that “god causes some facts.”

In demonstrating (2), he offers many examples in which his principles do explain facts without the added condition of god, or other supernatural forces. Darwin shows that god is not a necessary condition for his set of facts. Yet at the same time, recognizing that there is much ignorance in the details of how his principles cause facts, he firmly rejects the move from “ignorance of the cause”, to “god's will”, “plan of creation” or “supernatural cause.”

Darwin's argument that god is not a cause provides:

(a) Counterexamples:

“On the view of each organic being and each separate organ having been specially created, how utterly inexplicable it is that parts, like the teeth in an embryonic calf, or like the shriveled wings under the soldered wing covers of some beetles, should thus so frequently bear the plain stamp of identity!”

(Origin, p. 502, 1st)

(b) Consistency of method with our everyday lives:

“It can hardly be supposed that a false theory would explain, in so satisfactory a manner as does the theory of natural selection, the several large classes of facts above specified. It has recently been objected that this is an unsafe method of arguing; but it is a method used in judging of the common events of life.....”

(Origin, p. 442, 6th)

(c) Commitment to a specific principle of identity

“Although I am fully convinced of the truth of the views given in this volume under the form of an abstract, I by no means expect to convince experienced naturalists whose minds are stocked with a multitude of facts all viewed, during a long course of years, from a point of view directly opposite to mine. It is so easy to hide our ignorance under such expressions as the “plan of creation”, “unity of design”, and to think that we give an explanation when we only restate a fact. Anyone whose disposition leads him to attach more weight to unexplained difficulties than to the explanation of a certain number of facts will certainly reject the theory.,,,,.Nevertheless they do not pretend that they

can define, or even conjecture, which are the created forms of life, and which are those produced by secondary laws. They admit variation as a *vera causa* in one case, they arbitrarily reject it in another, without assigning any distinction in the two cases.”

(Origin, p. 444, 6th)

Though simple and easy to formulate, Darwin's Argument is grounded upon vast and complex philosophical assumptions. At the very foundation, he assumes that certain laws of propositional logic (laws of identity, excluded middle, and non-contradiction) apply and correspond to reality. Those laws are rigid, absolute, and ground a complex web of his further assumptions concerning truth, knowledge, identity, causation, and evidence.

Since 1859, history has been unfair and myopic toward Darwin's Argument. Sufficient evidence has been collected to demonstrate that the first premise of the argument, 'T/E explains facts', is true beyond a reasonable doubt. However, the second and fourth premises have been largely ignored. In my reading of his books on T/E, Darwin was equally firm and adamant that these premises were also true – 'T/C does not explain facts', and 'T/C is false'.

Darwin maintained that T/E and T/C are incompatible. If so, then evidence in support of T/E also stands as evidence against T/C. Consequently, his main pieces of evidence against T/C are:

a. God is not identifiable and re-identifiable in time and space. Hence, god is not distinguishable from not-god; one god is not distinguishable from another god; there is no way to determine that god at t^1 is numerically identical to god at t^2 . To claim that god is a cause “it seems to me that nothing is thus added to our knowledge.” (Origin, p.387, 6th)

b. Through all time on earth, without exception, every organism is the offspring of a parent; the relation of reproduction between parent and offspring is strictly physical; all or nearly all parts of the offspring are numerically identical to some parts of the parent; all parts develop gradually through generations of offspring; no parts of any organism suddenly appear fully formed; and the differences in mind between humans and other creatures is one of degree, not of kind.

Darwin clearly states that T/E is true, and that T/C is false. When in conflict, claims to truth need evidence, and the proponents of each must carry the burden of proof. Darwin made his case and provided evidence in support of T/E, and in opposition to T/C. If the claims of T/C are claims of truth, then the burden of proof is squarely on its proponents. The proponents of T/C must provide evidence that T/C is true, and that T/E is false.

Option 4: T/E and T/C are both true.

After returning to England from nearly five years of world travel, Darwin spent the rest of his life near London, in deep study. It's well known that during his adult life he was occasionally struck down by a mysterious and debilitating illness with symptoms including heart palpitations and nausea. Historians have long debated the causes of this malady, with only speculative determination. I'll join the list of speculators, and claim that Darwin was haunted by truth, driven into seclusion by his strange, pervasive explanation of life on earth, and that his thoughtful confrontation and rejection of Option 4 literally made him sick. Darwin's Argument is extremely radical and serious, and he knew it. In his heart he understood that his argument entails that all religion is false, and that vast populations of human beings are wrong.

"Both Defendants and many leading proponents of ID (Intelligent Design) make a bedrock assumption that is *utterly false*. Their presupposition that evolutionary theory is antithetical to a belief in the existence of a supreme being and to religion in general. Repeatedly in this trial, Plaintiff's scientific experts testified that the theory of evolution represents good science, is overwhelmingly accepted by the scientific community, and *that it in no way conflicts with, nor does it deny, the existence of a divine creator.*"

(Federal Judge John Jones III, Memorandum Opinion, *Kitzmiller vs. Dover Area School District*, Sec. H, Conclusion. Para. 2, 2005)

" While many religious people have found a way to accommodate evolution with their spiritual beliefs, no such accommodation is possible if one adheres to the literal truth of a *special creation*."

(Jerry A. Coyne, *Why Evolution is True*, , Introduction, p. xviii, 2009)

" The two realms of thought are quite distinct: science seeks to explain biological or physical phenomena by material mechanisms that can be identified and reproduced: religion rests on beliefs that require no verification apart from sacred writ. A debate that starts from irreducibly different modes of argumentation cannot be fruitful, if it is even possible. Still, unless Genesis is seen as the

account of events that actually took place, the theory of evolution does not at all oppose religious dogmas."

(Evolution, by Panafieu and Gries, p.19, 2007)

“Although much remains obscure, and will long remain obscure, I can entertain no doubt, after the most deliberate study and dispassionate judgment of which I am capable, that the view which most naturalists entertain, and which I formerly entertained – namely, that each species has been independently created – is erroneous.”

(Origin, Introduction, p. 8, 1st)

The question raised by Option 4 is whether T/E and T/C are both true at the same time. In order to evaluate this question, it may be helpful to distinguish between two versions of T/C:

1) Strong T/C

For all facts (x), god caused (x)

2) Weak T/C

For some facts (x), god caused (x)

1) Strong T/C

Strong T/C is a theory that is compatible with claims expressed by Deism, and other advocates of Intelligent Design, such that god is a super-agent that created the whole universe with all of its objects and natural laws; that the amazing order and complexity of parts is the plan of god and could occur only if created and sustained by an intelligent designer and superpower. Claims of strong T/C are also expressed by various forms of spiritualism such that god is a creative force or energy inside living things, with each body being a vessel of spiritual momentum; that the events of the world unfold with purpose and intention, and are “meant to be” according to a grand, mysterious plan. The general claim of all forms of strong T/C is that the universe with all its parts are one thing; that gods and creative forces are another thing; and that the gods and forces create and sustain the universe.

Darwin's own religious beliefs changed during his lifetime. Though not mentioned in the first and second editions, the last four editions of the Origin concluded with this sentence:

“There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one...”

(Origin, p. 450, 6th)

This allusion to a distant and isolated creator eventually fell to the wayside during his own search for religious explanation. Thoroughly convinced of the truth of his own T/E, as he applied the principles of T/E during his lifetime, a strong case can be made that he moved from Christian, to Deist, to Agnostic, to Atheist, finally residing in the extreme materialism of his theory of pangenesis. But that's a long story, filled with the intrigue of politics, marriage, and the diplomacy of public and private expressions. Regardless of his own religious journey and expressions of religious belief, the purpose of this analysis of Option 4 is to examine the compatibility of T/E and T/C.

Regardless of which form it takes, strong T/C is a dualism which requires that every fact has at least two causes: the objects and laws of the universe, and the plan and will of god. Given the assumptions of Darwin's Argument, can we make sense of this claim?

First, the strong version of T/C is closely related to the traditional First Cause Argument:

“It is maintained that everything we see in the world has a cause, and as you go back in the chain of causes further and further you must come to the First Cause, and to that First Cause, you give the name of God.”

(Why I am not a Christian, by Bertrand Russell, p. 6)

The strong version requires a conception of the universe as the set of individuals, and relations between individuals, that itself has a cause or creator. However, if the principle of causation is applied to the universe, if the universe is caused by god, then why should god not be subject to causation? If god caused the world, then what caused god? To stop at a first cause is arbitrary and unjustified. As Russell says, “If everything must have a cause, then God must have a cause.” (ibid. p.6). Strong T/C dissolves into an absurd infinite regress of causes.

Second, strong T/C is deeply affected by the question “Why is there something rather than nothing?” and it entails the claim that, at a certain point in time, something was created from nothing. However, this is an analogy with observations of our daily lives and is not a literal statement of fact. We experience birth, growth, and death; we experience the passage of time; we experience the vacuum in an empty jar. These experiences seem to be evidence that if you go backwards in time, you will eventually reach a point where, and when, no entities exist. However, in this argument, our experience is used as an analogy which assumes an observer that can distinguish existence from non-existence. As a matter of fact, it may literally be the case that material particles, and the relations between material particles, have always existed and will always exist.

Third, strong T/C has much difficulty with the problem of evil: if god created the world, and if god is omniscient, omnipotent and all good, then why is there so much suffering? This traditional argument is usually expressed in terms of human morality and freedom of the will, however, because of his deep understanding of all organisms, Darwin was particularly affected by this problem.

“That there is much suffering in the world no one disputes. Some have attempted to explain this in reference to man by imagining that it serves for his moral improvement. But the number of men in the world is nothing compared with that of all other sentient beings, and these often suffer greatly without any moral improvement. A being so powerful and so full of knowledge as a God who could create the universe, is to our finite minds omnipotent and omniscient, and it revolts our understanding to suppose that his benevolence is not unbounded, for what advantage can there be in the sufferings of millions of the lower animals throughout almost endless time? This very argument from the existence of an intelligent first cause seems to me to be a strong one; whereas the presence of much suffering agrees well with the view that all organic beings have been developed through variation and natural selection.”

(Quote from Autobiography of Charles Darwin as used in Paul Edwards, God and the Philosophers, p. 211)

If god is the cause of all events, as claimed by strong T/C, then god is the cause of evil events. Thus, god is evil.

Fourth, every event in our lives is a very complex set of parts. When you make a cup of coffee in the morning, you have your sleepy body, hot water, coffee and a cup. But there are so many

more parts to that fact – you have a room with a floor, water pipes connected to a well, people driving by on their way to work, oxygen in the air, the sun coming up and a seemingly infinite complexity of facts. All these facts compose the context of making a cup of coffee.

Some elements that populate any event are relevant to a description of that event, and some elements are not relevant. The process of rationality, and the fact of paying attention, sort out the relevant parts. An essential element to rationality is to identify causal relations within each event. We understand, explain and respond to events in our lives not only by identifying states of affairs that do have causal influence, we also eliminate states of affairs that, even though they exist and are essential to the event, do not have causal influence.

In our everyday lives, we are extremely successful at identifying which states of affairs do have causal influence from those that do not have causal influence. When we are hungry, we eat, when we're thirsty, we drink, when our phone rings, we answer it. If someone constantly answers their phone when it doesn't ring, or if they take off their shoes every time it rings, then we say they are detached from reality. We can function in the real world only if we understand the actual causal relation between facts. The overwhelmingly prevalent reason, although not always the main reason, for believing and acting that “x causes y,” and “(not-x) does not cause y,” is that x causes y. The innumerable cases of successfully identifying causes in our own lives, and in the lives of all sentient creatures, is evidence that a particular effect does have a particular cause, and that we know that a particular effect has a particular cause.

Many events have a complex cause, and the specific conditions are obscure and elude identification (e.g. the 2007 collapse of the world economy). But more importantly to Option 4, some events seem to have more than one cause (e.g. a man is shot by two guns at the same time with bullets entering his heart simultaneously, a fire is caused by an arsonist and a lightning strike simultaneously). We call these cases “over-determination” and they seem to be counter-examples of the ordinary demand of simplicity: to identify a single sufficient event as the cause of an effect. However, the claim of strong T/C is much different than ordinary over-determination.

“In standard cases of over-determination, like two bullets hitting the victim's heart at the same time, the short circuit and overturned lantern causing a house fire; and so on, each over determining cause plays a distinct and distinctive causal role. The usual notion of over determination involves two or more separate and independent causal claims intersecting at a common effect.”

Even if an event occasionally has more than one cause, each of the causes must be identifiable and separate from each other. The claim “some events have more than one cause” may well be true. However, the strong version of T/C claims that “Every event has more than one cause” is true. For any particular event, say an earthquake, a traffic accident, or a mass shooting at an elementary school, the cause, the explanation, the reason the event occurred, is not only the shifting of the tectonic plates, the driving too fast on an icy road, or the bitter hatred of a fellow student: the cause in every case is also “god's will.” This version of T/C claims that god created each thing in the universe, and sustains (causes) the relations between things.

Given Darwin's assumptions about logic, truth, knowledge and identity, the claim “every event has more than one cause” cannot be true. In order for this statement to be true, its negation must be false. There must be some possible difference, some criteria of truth, that distinguishes the true statement from the false statement.

Statements concerning causation use, and are grounded on, language and logic; they assume a theory of word, object and appropriate use of words. However, those statements are not about language and logic, they are about the world in which we put language and logic to use. In the real world, if “every event has more than one cause” is true, then “some events have only one cause” is false. Yet, tests, predictions and convergence provide evidence and a way of determining that “some events have only one cause” is true. If you stick your hand in the campfire, you will get burned. Rationality, and survival in the actual world, require that we distinguish between a campfire and a bucket of water. We know, and we can tell, that the fire burns, and the water does not. At least in some cases, a specific event is a part of a series of events that are connected through time by causal relations. One event is the only cause of another event, and both the event and the relations are identifiable. This would not be true if strong T/C obtained.

Also, strong T/C certainly wants to make the distinction between one god-as-cause from a different god-as-cause, or between multiple gods-as-cause. One T/C says, “god's will”, another T/C says, “Allah's will”, another says, “Vishnu's, Anantasesha's, and Krishna's will”. But if “every event has more than one cause” is true, then there must be a way to distinguish god from not-god, one god from a different god, and one god from multiple-gods.

As Darwin said, if strong T/C cannot come up with criteria for identifying god-as-cause, then, in using “god's plan” to explain facts, “nothing thus is added to our knowledge.” The coherence gained by limiting causal relations to only one event, or set of events, is not only practical, not only the way we actually explain events, it's the way the world is. Given Darwin's assumptions, strong T/C is false.

2) Weak T/C

By claiming “for some facts x, god caused x,” the proponents of weak T/C maintain the identical ontological structure of reality as strong T/C; a dualism in which there are at least two kinds of entities and relations between entities; a spiritual, non-material, supernatural realm, and a material, physical, natural realm. However, they claim that only some of the events of the material, physical world have supernatural causes.

In making the distinction between “some” and “all”, weak T/C seeks to accommodate a special moral status of human beings as causal agents. Although the descriptions vary greatly between the proponents of weak T/C, basically, human beings are understood as having two parts, a body and a mind (soul), having freedom of the will and being responsible for their actions (persons are moral agents that could have done otherwise), and having personal and individual relations with god(s). In whatever form, weak T/C maintains that god acts within human history, and causes some events.

Although more nuanced, weak T/C is subject to the same criticisms as those leveled against strong T/C. The proponents of weak T/C can maneuver through some of these critiques, but the resulting doctrine is arbitrary and unconvincing.

First, weak T/C can claim that god created the universe with its natural laws, e.g., with the principles of evolution, then disappeared only to have occasional causal influence during the earth's history of events. However, even with god's disappearance, any claim that god created the universe is subject to the same objections: there is no good reason to stop with a First Cause, god is also subject to causation. There is no good reason to claim that only one god is the creator of the universe, rather than an unlimited number of gods.

T/C can reply that god is separate and distinct from the universe of material bodies and natural laws; that god and the universe have always existed; and that, although god did not create the whole universe, god did create life on earth, and does cause some events on earth. To maintain this position, however, weak T/C must accept that god does not explain why there is something rather

than nothing (because it is possible that the universe has always existed); and that god does not explain the existence and order of the universe as observed in the relation of material bodies in time and space (because it is possible that the order of the universe has always existed).

“However, we really have no reason whatever to suppose that the order that characterizes the universe at present did not always belong to it. On the contrary, we appear to have every reason to maintain that objects have always behaved in accordance to the same laws.”

(God and the Philosophers, by Paul Edwards, p. 295)

The move from “all events” to “some events” allows T/C to escape the criticisms of the First Cause argument. However, the move separates life on earth, or at least the status of human beings, from the great web of planets, stars and galaxies that populate the rest of the universe.

Second, weak T/C can avoid the problem of evil by claiming either; (a) evil events are caused by the devil or some other malevolent supernatural power, and that good events are caused by god. Human life on earth can be explained as a battle between good and evil, between a good god and a bad god. Or (b) god created man as a moral agent with freedom of the will to decide between good and evil. T/C claims that human agents are morally responsible for their actions because they could have done otherwise when making decisions on moral actions. The blame for poor choices is laid upon the moral character of persons.

Neither of these alternatives escape Darwin's own response to the problem of evil because he referenced the great suffering of creatures other than humans - if god created other organisms, and those other organisms suffer, then god is evil. However, each position does allow T/C to consistently maintain that god is the cause of some events, but not the cause of all events. Weak T/C seems to accommodate the problem of evil, and avoid this criticism of strong T/C.

Third, as with strong T/C, weak T/C fails to justify claims to over-determination. Human beings, and also an untold number of less highly-organized creatures, have a deep recognition of causation, and are able to distinguish causes and effects. We recognize that some actions will satisfy needs and are appropriate, and that other actions will not satisfy needs and are not appropriate – to drink water will satisfy thirst, whereas to stand on one leg will not satisfy thirst. An ancient rationality shared by many, if not all, sentient creatures, notices and recognizes a distinction between different

causal influences. It's true and undeniable, our daily lives are full of this recognition of causation, and in order to live you will act appropriately. We do distinguish causes.

T/E claims to identify the causes of some facts, but not all facts. For example, T/E claims to explain why your child was born with a tailbone, but it does not claim to explain why the light goes on when you flip the switch in your kitchen. The causes of these two facts are separate and distinguishable.

According to Option 4, weak T/C also claims to identify the causes of some facts, but not all facts. As required by this option, if both T/E and T/C are true, then each correctly identifies the separate and distinguishable causes of the same facts. Whereas T/E claims that your child has a tailbone because she is descended from an ancient ancestor that had a long tail, T/C claims that your child has a tailbone because it's god's plan; that god created humans to have tailbones. According to Option 4, both are correct, and the same fact has more than one cause.

Weak T/C has a serious, if not fatal, problem because it entails an over-determination of a multitude of facts. Each fact is subject to the question "Why two causes instead of one?". Over-determination is counterintuitive and rare, if ever, in our everyday lives, and in order to avoid a charge that such a claim is arbitrary or false, proponents of T/C must frequently provide the criteria for distinguishing one cause from multiple causes. T/C must provide evidence for multiple causes of Darwin's facts - a burden weak T/C cannot shoulder.

Fourth, the most formidable objection to weak T/C is the problem of identity. The proponents of any T/C must be able to identify god, and distinguish god from not-god. Given Darwin's principle of identity and correspondence theory of truth, a necessary condition for determining any claim "x caused y" is that both "x" and "y" must be identifiable and distinct; the cause and the effect must be separate.

If everyone agrees with Option 4, as in Judge Jones' opinion in the Dover case, then the problem of identity does not arise. However, if someone interpreted Darwin's Argument as an objection to Option 4, then the problem does arise and both T/E and T/C are called into the process of justification.

In order to justify the claim "x caused y", both T/C and T/E must identify x, identify y, and identify the relation of causation between x and y. Darwin used a specific principle of identity to distinguish a set of facts, then used a set of tests, predictions and convergence of other facts to distinguish a set of principles, and then provided evidence which demonstrated beyond a reasonable

doubt that specific facts are instances of the specific principle. Darwin lifted the burden and satisfied the process of justification. T/E is true.

If T/E and T/C share the same philosophical assumptions, and if both are true, then T/C is subject to the same process of justification. For those same facts “y”, T/C must provide evidence that, first, god did cause y, and second, god did not cause z (any specific fact that proponents of weak T/C claim that god did not cause - e.g., that god is not the cause of a person's evil act). As with T/E, T/C must be subject to the challenge of example and counterexample.

If “god did cause y” and “god did not cause z” are true, then T/C must provide evidence that the counterfactuals “if not-god, then not-y” and “if god, then not-z” are also true. Part of the burden of making claims to causation is to account for counterfactuals. If you claim that flipping the switch causes the light to go on, then flipping the switch and the light not going on, and the light going on without flipping the switch, are counterexamples. Counterexamples are evidence that the claim is false. T/E is a counterexample to T/C.

In order to test the claim that god caused y, god must be identifiable and distinguishable from not-god. Darwin's principle of identity requires that the cause of a fact must be identifiable and re-identifiable in time and space. T/C fails the requirements of causal explanation because it is always impossible to determine whether god is part of the causal chain that led to the fact. In order to justify claims to causation, the presence, or absence, of the claimed cause must make a difference. Without a difference, the claim “adds nothing to our knowledge” and the claim is false.

Option 4, the widely held position that both T/C and T/E are true, entails that some facts about living organisms, in particular about human beings, have multiple causes at the same time and in the same place. However, the two theories are vastly different. With T/C, it is both in principle, and in fact, impossible to distinguish the difference between cause and effect, and there is no way to determine whether or not the principles of the theory have instances. With T/E, it is both in principle possible, and in fact, frequently possible, to distinguish the difference between the cause and the effect, and there is a way to determine whether or not the principles of the theory have instances. Consequently, given Darwin's assumptions about logic, truth, knowledge, identity, causation and evidence, we are led to the conclusion that Option 4 is contradictory, and that T/C and T/E cannot both be true.

Conclusion to Section IV

According to my interpretation of Darwin's Argument, his philosophical assumptions, and his evidence, we are led to the conclusion that only Option 3 is correct: T/E is true, and T/C is false.

However, very few people accept this conclusion and believe it. Why is that? Not even the highly intelligent and educated judge, nor the expert witnesses for the Plaintiffs in the 2005 Dover case, accepted this conclusion. In all its various forms, T/C has enormous appeal, and people around the world have a great reluctance to reject it. In order to understand and explain this apparent impasse, we need to further examine the assumptions and consequences of Darwin's Argument. As we will see in the next section, many of our fundamental beliefs about the world are accepted or rejected, not by clear criteria of truth, but rather by a web of conditions, including the implications of these fundamental beliefs. If a belief entails a conclusion that is unacceptable to an individual, then a negation of that belief may seem more reasonable, regardless of truth.

Section V:

Implications

I have examined and attempted to identify the philosophical assumptions Darwin made in formulating T/E and developing his argument. Each of these assumptions concerning logic, truth, knowledge, identity, causation, and evidence are themselves theories that have been subject to a long history of dispute. They form a complex web that philosophers continue to unravel.

It may be that Darwin's own observations and conclusions rest upon a conceptual foundation that can be called into question. However, to challenge Darwin is a heavy lift. His research was remarkably broad and thorough, and his theorization was strongly supported by observations of domestic plants and animals at the most ordinary, common sense level of farmers and gardeners. To this day, the predictions and discoveries of many branches of science (biology, genetics, geology,

embryology, medicine, chemistry) almost unanimously support T/E – and that's only half of it. Anyone that has ever looked at their own son or daughter and seen themselves; anyone that has wondered why momma dogs have baby dogs instead of baby cats; anyone that has read a newspaper article about the use of DNA to convict a criminal; anyone that has an opinion about the Endangered Species Act; all have begun to understand evolution, and all, at least partially, have adopted Darwin's assumptions. T/E and its assumptions permeate everyday life in all cultures around the world. T/E works, and it's everywhere.

Understanding truth is critical to our everyday lives – no matter how thirsty you are and no matter how strongly you wish for it, you can't take a drink if there is no water in the glass. To drink from an empty glass is delusion. However, life is complex and there is much we don't know. In many parts of our lives we base our decisions and actions, not on truth and fact, but on what makes sense at the time, and on whether those decisions cohere with our own web of beliefs, hopes, teachings, experiences and assumptions. Each person that uses language; that recognizes themselves as an individual amongst similar individuals; that has a need and deliberates on how to satisfy that need; bases their decisions and actions on a set of philosophical assumptions and on the logical consequences of those assumptions.

One of the ways to determine the truth of some theories in philosophy is to follow the assumptions and premises to their logical conclusions. If the assumptions and premises have consequences that are false, absurd, despairing or other ways unacceptable, then they can be called into question. What are the philosophical consequences of T/E and T/C?

As listed in Section I, these are Darwin's philosophical assumptions:

1. Truth
 - Truth consists of a correspondence between language, thought and reality
2. Knowledge
 - Knowledge is true belief justified by evidence
3. Logic
 - Certain classical laws of propositional logic correspond to the structure of reality.
4. Identity
 - An individual exists if and only if it is identifiable and re-identifiable in time and space.
5. Causation

- Causation is a mind independent relation of necessity between facts/events that are instances of general principles that are true.

6. Evidence

- Evidence is a fact which identifies a causal relation between separate and independent facts.

As I have understood and presented Darwin's argument, T/E and T/C are extreme and incompatible. T/E is a full conjunction of 1-6, while T/C is a partial disjunction of 1-6. T/C entails a denial of one or more of Darwin's assumptions. Further, to follow his argument, I believe that T/E entails extreme materialism, and that T/C entails extreme dualism.

Materialism and dualism are traditional, metaphysical theories about what specific things, and what kinds of things, exist. Materialism claims that there is only one kind of entity: a material body. Dualism claims that there is more than one kind of entity: a material body and something else. By “extreme” I mean, first, that each of these sets of beliefs, materialism and dualism, are exclusive and contradictory to the other set, and second, that there can be no exceptions. For T/E, every organism that has ever lived is an instance of the principles of T/E. For T/C, not every organism is an instance of the principles of T/E, and some entities are instances of the principles of T/C. If T/E entails materialism, and T/C entails dualism, and if materialism and dualism are contradictory, it follows that T/E and T/C are contradictory.

Extreme Materialism

Extreme materialism is a theory which claims that existence is limited to only material bodies and the relations between material bodies. Material bodies are themselves composed of material bodies and their relations. By looking through a microscope you can see the smaller and smaller particles within specific material bodies, and by looking through a telescope you can see a larger and larger space within which material bodies are parts. Apples, amoebas, and human brains are instances of material bodies, and distance, weight, size, location, and causation are instances of relations between material bodies. These relations between material bodies are not entities, rather they are interactions between entities. Time and space are also relations, but somehow more fundamental, as they form the very structure of reality in which material bodies are located. This location in time and space is what determines the identity of an individual and makes it possible to distinguish one

individual from another individual. According to extreme materialism, only material bodies located in time and space exist.

Darwin's T/E is compatible with extreme materialism, and I believe, provides arguments in support of extreme materialism.

“Therefore, I cannot doubt that the theory of descent with modification (T/E) embraces all the members of the same great class or kingdom. I believe that animals are descended from at most only four or five progenitors, and plants from an equal or lesser number.....

Analogy would lead me one step further, namely to the belief that all animals and plants are descended from some one prototype. But analogy may be a deceitful guide. Nevertheless all living things have much in common, in their chemical composition, in their cellular structure, their laws of growth, and their liability to injurious influences.....

Therefore, on the principle of natural selection with divergence of character (T/E), it does not seem incredible that, from such low and intermediate form, both animals and plants have been developed; and, if we admit this, we must likewise admit that all the organic beings which have ever lived on this earth may be descended from some one primordial form. But this inference is chiefly grounded in analogy and is immaterial whether or not it be accepted.”

(Origin, p. 446, 6th)

I believe that in the last sentence of the above quote, Darwin is wrong. His inference is not grounded in analogy, the inference is grounded in fact, and in his philosophical assumptions. Also, the acceptance of his inference is not “immaterial”, I believe that his inference is correct, profound, and essential to the understanding of life on earth. The above quote is the logical consequent of T/E, and a final dagger in the heart of T/C. The reference to “analogy” is a smokescreen of self-defense. He recognized that the application of his radical theory to the very origins of life on earth, could well subject him to the wrath and rejection of the religious and political institutions of his day.

Regardless of the denial, buried in his collection of facts and theorization, Darwin provides three arguments in support of extreme materialism:

Argument 1

Ordinary generation is strictly physical. The reproduction of single cell organisms (cell division) and multiple cell organisms (sexual and asexual reproduction) is observable and located in time and space. There are no components to reproduction other than cells, and the parts of cells. The entire processes of cell division, and cell union (fertilization of egg by sperm and egg by pollen), occurs at specific locations in the unified framework of time and space.

Further development of Argument 1 can be parsed from Darwin's theory of pangenesis. One of the relations between parent and offspring is that of numerical identity. During the processes of cell division and fertilization, a material part of the parent literally becomes a material part of the offspring. Part of the parent and part of the offspring are numerically identical.

Inheritance is also a relation between parent and offspring. With inheritance, certain properties of the parent are shared with the offspring. For Darwin's theory of pangenesis, the cause of inheritance is the numerical identity between part of the parent and part of the offspring. With both cell division and fertilization, material passed from the parent to the offspring contains the gemmules of the parent. Gemmules are tiny particles of matter which contain most, if not all, of the information concerning the structure and parts of the parent. These gemmules develop into the structure and parts of the offspring, and are then passed on to their offspring, and to their offspring, through all subsequent generations.

Gemmules are strictly material bodies passed from generation to generation by means of ordinary reproduction. Gemmules themselves are made of parts. As gemmules pass from generation to generation, some parts change, some parts disappear, and some parts, although unfathomably divided, remain numerically identical to parts of the gemmules of the original single cell organisms from earth's early history. This numerical identity of matter between parent and offspring, parent and grand-offspring, parent and great grand-offspring, and on and on through all generations of the same lineage, is fundamental to Darwin's T/E, and provides the grounds for its materialism. Though incredibly small and complex, these gemmules are strictly material bodies located in time and space that remain numerically identical through multiple generations.

In genetics, much is made of the seeming randomness and uncaused nature of the mutations of parts of cells (genes) as they divide (replicate). Also, in molecular phylogenetics, much is made of whether, and how, genetic material from one organism enters and becomes part of the genetic material from a separate organism. While the subjects of random events, indeterminism and genetic modification are very significant issues in philosophy, each are irrelevant to Darwin's arguments

about extreme materialism. Whatever the composition and structure of the particles (proteins, nucleic acid, bases), and however they fit into the causal chain (parent to offspring transfer, horizontal gene transfer, mutation), Darwin's principle of identity still requires that the particles involved in each process are identifiable and re-identifiable in time and space. Genes and their parts, however they combine, divide, or pass on, are material bodies.

Argument 2

The relation between parent and offspring is one of numerical identity. Even with the mutation of some parts, every part of the offspring comes from the parent, and no part suddenly appears. The few single cell organisms at the beginning of life on earth divided and spread their populations across the extreme conditions of the early planet. After three to four billion years of cell division and interaction with changing conditions of life, some single cell organisms (bacteria, archaea, eukaryotes) gradually began to divide into multiple cell offspring.

As the new multiple cell organisms succeeded and flourished, the gemmules passed on from their single cell parent increased in complexity, modified, and incorporated multicellular information. This multicellular structure gradually became heritable and the modified gemmules of early multicellular parents were passed on to generations of multicellular offspring.

However, some of the very early single cell organisms did not change into multiple cell offspring, and the gemmules of these parents did not vary greatly as parents divided into offspring, and their offspring into further offspring. The relation of numerical identity between parent and offspring in the process of single cell division has remained the same since the earliest life on earth. The organisms that inhabit the extreme environments of current earth (hot springs in Yellowstone Park, deep oceanic trenches) are direct descendants of the earliest cells, and they, according to Darwin's pangenesis, still contain the earliest gemmules. Cell division occurred at a specific time, and in a specific location, and some part of these current organisms is numerically identical with the earliest life on earth.

Darwin's T/E claims that the gradual evolution of single cell organisms into more complex multiple cell organisms is the same strictly physical process as the cell division of the earliest single cell organisms. The relation between parent and offspring of multiple cell organisms is also one of numerical identity and inheritance. As with single cell organisms, the offspring of multicellular organisms are also formed from the material of its parent.

As these new multiple cell organisms reproduced, the offspring were similar to the parent. From the very beginning of multiple cell organisms, the offspring inherited properties of the parent. According to Darwin's theory of pangenesis, the cause of this inheritance is the numerical identity of material between parent and offspring.

The process of reproduction of both single cell organisms and multiple cell organisms is the same cell division – the parent divides and the material of the parent is numerically identical with the material of the offspring. The offspring comes from its parent and only its parent.

Darwin's second argument for extreme materialism maintains that; regardless of the complexity of the organism, every organism is an offspring of a parent, and every offspring inherited all of its parts from its parent, plus minute variations (due to, as discovered eventually, mutations). The cause of this inheritance is numerical identity, the sharing of material between parent and offspring. At no point in time during the history of life on earth did any part of any offspring suddenly appear. All parts are inherited, with slight variations.

Argument 3

“Nevertheless, the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind.”

(Descent of Man, p. 151)

The difference in parts between any organism, is one of degree, not of kind. At no point in time did any part of any organism suddenly appear. Darwin's third argument for extreme materialism uses the process of reverse engineering, and claims that every part of every complex organism is inherited from a less complex part of an earlier and less complex organism. At no point in time during the history of life on earth did any organism, or part of any organism, suddenly appear. Parts develop gradually according to the principles of T/E.

Darwin argues that even the most mysterious and complex instances of human intelligence – consciousness, self-consciousness, sensations, emotions, intentionality, concept formation, morality, empathy, rationality – are inherited from earlier and less complex creatures. Every organ, and relation between organs, was passed on to each human baby from its parents by means of numerical identity – the offspring was literally made from the material of the parents. This third argument maintains that

consciousness is a strictly material system of parts passed from parent to offspring by numerical identity. Consciousness is heritable because it is physical. Consciousness is heritable because it is a part of the numerical identity between parent and offspring.

Darwin's T/E traces the parts of current organisms backward through time by tracing descent – from current offspring to its parent, then to its parent, and then to its parent – into an extremely ancient past. The difference in mind between humans and the higher apes is one of degree, not of kind. The difference in mind between the higher apes and the lower apes is one of degree, not of kind. The difference in mind between the lower apes and its ancient ancestor with four fins, long tail and swim bladder is one of degree, not of kind. The difference in mind between this water breathing progenitor and an oyster is one of degree, not of kind. The difference in mind between the earliest oyster and the earliest single cell organism on earth is one of degree, not of kind. The difference in mind is strictly, and only, a difference in physical complexity, not in ontological kind of entity.

There is no ontological distinction between the mind of man and the stimulus/response relation between the earliest single cell organism and its conditions of life. By reverse engineering, Darwin traced the sharing of material from any offspring to its parent by following the causal chain to the beginning of life on earth. Each transfer of material was located in time and space, and at no point did another kind of entity suddenly appear, only the quantity and complexity of material shared between parent and offspring.

One of the conditions of numerical identity is that there are no exceptions. There is no break, or discontinuation, of numerical identity between any current organism and the few single cell organisms at the beginning of life on earth. This condition was the basis of Darwin's frequent claim that any true counterexample would be “fatal to my theory”. It is impossible that any organism (human baby), or any part of any organism (brain, liver, eye), would appear suddenly out of nowhere, without descent. Every part of every offspring was passed on by its parent through the rigid and necessary relation of numerical identity. Darwin's third argument claims that the minds of humans, apes, birds, oysters, and ants, are different only in degree of complexity, not in kind of entity. At no point in time did any new kind of entity (i.e., consciousness, mind, soul) come into existence. The numerical identity of parts between current organisms and the few single cells at the beginning of life on earth, is discovered and known through the process of reverse engineering. Going backwards through time, each offspring is made of its parent, and that parent made of its parent, and so on, without exception, until the beginning of life on earth.

Implications of T/E

These three arguments summarize Darwin's contribution to the old dispute between materialism and dualism. As mentioned earlier in this section, the criteria that humans use to make life's decisions about one's own identity, moral behavior, religious beliefs, and understanding the life, and death of yourself and your family, are not simply a matter of truth, fact and evidence. Basic assumptions and beliefs are also much influenced by their logical implications, that is: whether these implications make sense, and how they make you feel about life and death.

Darwin's T/E has severe implications for certain long discussed and closely related issues of philosophy. Each issue warrants a much more detailed analysis than I am capable. However, despite the risk of oversimplification, I would like to summarize Darwin's implications on some of these issues.

A) Mind/Body Problem

“That some physical change is produced in the nerve cells or nerves which are habitually used can hardly be doubted, for otherwise it is impossible to understand how the tendency to certain acquired movements is inherited.”

(Expressions, p. 39)

“...the nerve cells of the brain in the highest as well as the lowest members of the Vertebrate series, are derived from those of the common progenitor of this great kingdom. For we can thus see how it has come to pass that certain mental faculties, in various and widely distinct groups of animals, have developed in nearly the same manner and to nearly the same degree.”

(Descent of Man, p. 687)

Human beings have always noticed the difference between living things and non-living things. Living things - sheep, garden vegetables and other humans - follow their comrades, grow when watered, and talk about their dreams. Whereas non-living things - rocks, corpses and robots - have no feelings, were perhaps once alive but are now dead, and are assembled from chips, wires and batteries. The mind/body problem is a philosophical issue which examines and seeks to explain the

difference between living and non-living things by identifying the nature of the body, the nature of the mind, and the relation between the two.

Using Darwin's method of theorization, we need to start with facts, then try to identify the causes of those facts: each human being is a material body with size, weight, structure and organs; we do have thoughts, sensations, emotions, memories, intentions, and spiritual longings; we do respond to the world around us; we do communicate our thoughts and feelings to other human beings; we do deliberate and have reasons for action; there does seem to be a gap between thoughts and brains, sensations and sense organs; words and objects, and life and death. Theories addressing the mind/body problem need to accommodate these facts as they seek to identify the ontology of consciousness, and describe the relation of mental causation.

A common and traditional dualism has long held that the body and mind are separate and distinct substances with the body composed of material, physical substance (cells, nerves, blood, bones) located in time and space, and the mind, composed of non-material, mental substance not located in time and space. The many variations of substance dualism make further claims about the nature and direction of causation between these two kinds of entities (epiphenomenalism, interactionism, parallelism, occasionalism, pre-established harmony - Metaphysics, by Richard Taylor, p.19)

Property dualism (double aspect theory, person theory, emergent property theory, supervenience theory) is another broad set of explanations that focuses on the constant conjunction, close correlation, and supervenience, between brain events and events of consciousness. Much progress has been made in neural research and brain mapping such that specific functions/activities of consciousness (e.g., fear, dreaming, desire) can be associated/correlated with the neural activity or stimulation of specific parts of the brain. Some mind/body theories identify the events of consciousness as “emergent properties”, or “double aspects” of brain events. These mental qualia are somehow a part of a mental/physical union, but also somehow different, and they retain a distinction of identity. Though the relation is close and getting closer, with property dualism, mental events and brain events are still ontologically distinct. Property dualism is still dualism, with linguistic and conceptual analysis revealing ways in which properties of consciousness are referred to as different than the ways brain properties are referred to. As discussed earlier, Strawson's claims that “persons” are a kind of entity with both physical and mental properties, and that “the concept of a person is

primitive”, is an example of property dualism; subtle explanations that still insist on an ontological distinction between the contents of consciousness (qualia) and the parts of material bodies.

Materialism on the other hand, is a traditional but less common theory which claims that only material bodies exist. The variations of materialism make further claims about the relation of macroscopic and microscopic layers of physical matter; whether statements about consciousness are reducible to statements about physical matter; and the nature of the ultimate physical particles.

Identity Theory is a contemporary form of materialism which acknowledges the supervenience of mental events and neural events, and makes the claim that the two events are numerically identical – mental events are neural events. Concerning the ontology of consciousness, identity theorists claim that there is only one kind of entity, a material body located in time and space – consciousness is the stimulus/response relation between particles. Concerning the issue of mental causation, identity theorists claim that all the diverse events of consciousness – thoughts, dreams, sensations, intentions, emotions – are literally a complex web of neurons, synapses, chemicals, electrical charges, nerves, muscles, bones, and organs engaged in causal relations with other bodies of the material world. They claim that only material bodies can be instances of general causal laws and specific causal relations; that causation is a relation between things that exist in time and space.

Darwin's argument lands squarely in support of Identity Theory, and, I believe, his T/E is incompatible with any dualistic theory of mind. His argument is based upon the strict materiality of cell division, and the numerical identity of parts between parent and offspring. The original single cell organisms on earth responded to their conditions of life according to a simple, fundamental stimulus/response causal relation that is part of the structure of reality. Over hundreds of millions of years, these early single cell organisms reproduced by cell division, and modified according to the principles of T/E. Whatever the mechanics of cell growth and change (by mutation, by invasion of bacteria, by usurping genes in the genetic sequence), some single cell organisms varied and modified into simple multiple cell organisms, then into more complex multicell organisms. This modification was also strictly material, and the modified parts were passed from parent to offspring by numerical identity – the literal sharing of matter. T/E claims that this strictly physical process of ordinary reproduction, and the sharing of matter between parent and offspring, explains – causes – the entire lineage of living organisms from the earliest single cells to current humans beings, including all other living things - without exception.

Over millions of years of reproduction and causal relations with changing conditions of life, the material of simple parents divided into complex offspring with interconnected parts. Darwin's previous quote on inheritance, and his three arguments for materialism, imply that consciousness is not a kind of entity, it is physical matter in changing degrees of complexity. As the material bodies of offspring change in complexity, so does the causal interaction between their parts and their conditions of life. Consciousness gradually develops as nerves, senses and other organs gradually develop – they are one and the same.

Throughout his books on T/E, Darwin is greatly puzzled by the inheritance of instinct, complex habitual behavior, consciousness, and mental causation. Offspring are born with consciousness, behavior, and mental interactions (paying attention, moving toward food and away from harm) that are very similar to those of their parent(s). His theory of pangenesis attempts to explain this similarity by proposing that tiny particles of matter (gemmules) which contain specific information of the parent (size, shape, organs, instincts, consciousness) are passed from parent to offspring by ordinary reproduction (cell division, fertilization). He goes further and claims that some numerically identical gemmules are passed on for many generations of the same lineage. Consequently, according to pangenesis, the explanation (cause) of similarity through many generations is the numerical identity of gemmules through time and space.

Using his philosophical assumptions, his sets of facts, and his principles of T/E, Darwin argues for Identity Theory: ordinary reproduction is a strictly physical process; inheritance is caused by the numerical identity of matter shared between parent and offspring through many generations; only material parts are heritable; instincts, behavior, consciousness, and mental causation are heritable; consequently, mind and body are material; consequently, mind and body are numerically identical. By applying the principles of T/E to Darwin's facts about organisms, the numerical identity of mind and body is discovered.

Darwin was intensely interested in consciousness and mental causation. His argument between T/E and T/C is grounded on his conviction of the numerical identity of parts between parent and offspring for many generations – the relation of descent. The numerical identity of mind and body is a logical consequent of T/E. All human experience, even religious experience, and even the belief in false propositions, is literally a complex web of causal relations between neurons, synapses,, charged particles – whatever the details – and an organism's conditions of life in the material world.

T/E concludes that any person, dog, goldfish, or houseplant, is only one kind of entity, a material body located in time and space – without exception.

B) Personal Identity

While recently searching my file of personal documents, I came across my “Certified Copy of Birth Transcript” issued by the state of South Dakota, Division of Vital Statistics – my birth certificate. This legal document is the official, governmentally sanctioned recognition of two important facts of my life – date of birth and place of birth. If I were to apply for a passport, driver's license, or social security card, I would need to provide a birth certificate to show that I really am the person I claim to be.

Yet, that date was long ago, and that place was demolished and replaced with a housing development. I don't look much like the infant that was certified, I don't remember the event of being born, and I would hazard to guess that nearly every cell in that infant's body is gone and has been replaced. However, the state of South Dakota says I am that person. Is the state wrong? What is it that makes this current person sitting at the kitchen table with a pencil in his hand, the same person as that pink, hairless infant?

Darwin's T/E has rigid implications for the issues of personal identity. By limiting the ontology of consciousness to particles of physical material, and by limiting the instances of causal relations to material bodies that are identifiable and re-identifiable in time and space, T/E identifies any person with their body, and only their body. The numerical identity, and consequent sharing of parts, between parent and offspring are the grounds for the specific date of birth and place of birth. The date of birth (cell division, laying of eggs, or whatever form of reproduction) and place of birth are determined by the location of the parent - at that location in time and space, part of the parent becomes the offspring. For any organism, from simple to complex, that individual is born, grows, and matures only according to the strictly material laws of cell division, and the limits of its conditions of life.

The human body is very complex and very old, but, according to Darwin's T/E, its origins are single cell organisms, and at no time in the history of its modification (evolution) did a non-material mind, soul, or self, appear. Although certain facts may serve as evidence for identity, what makes the newborn infant on a farm in South Dakota in 1951, the same person as the man at the kitchen table writing about Darwin in 2018, are not the memories, sense of self, nor convictions about life and

death. What makes these different looking bodies the same person, are the shared locations in time and space through every instance of that life. According to T/E, I am this body and only this body, with parts inherited from my parents by means of numerical identity, and you are your body and only your body with parts inherited from your parents by means of numerical identity.

C) Life after Death

“As for a future life, every man must judge for himself between conflicting vague probabilities.”

(The Autobiography of Charles Darwin, p. 61)

“He who believes in the advancement of man from some low organized form, will naturally ask how does this bear on the belief in immortality of the soul...Few persons feel any anxiety from the impossibility of determining at what precise period in the development of the individual, from the first trace of a minute germinal vesicle, man becomes an immortal being; and *there is no greater cause for anxiety* because the period cannot possibly be determined in the gradually ascending organic scale.”

(Descent of Man, p. 683)

Under ordinary circumstances, most organisms work hard to stay alive, and work hard to avoid death. Human beings, in particular, intentionally and consciously try very hard to live, and often endure great suffering in order to avoid death. Our basic attitude is that life is a good thing, and death is a bad thing.

For ages, religious leaders, philosophers, and scientists, have contemplated life and death, and have passed on a wide range of teachings, scriptures, and claims, about this relation. Many people around the world hold beliefs about this relation of life and death such that death is not the end, death is survivable, and there is life after death.

The above quote is accurate, the many variations of belief in life after death are conflicting and vague. Some believe in the resurrection of the body when god calls his disciples to raise from the dead; some believe in reincarnation as the soul of an individual migrates from creature to creature through endless time; some believe that their earthly consciousness will become one with a Universal Mind or Cosmic Consciousness; some believe in alternative parallel universes that are concurrent with ordinary time and space, and individual souls pass into other planes of existence; many simply

believe that there has to be more to life than the daily struggle, that we don't know what will happen, but that that *something* will happen – period.

It's easy to get lost in the complexity and subtlety of claims about life after death. However, in the most basic terms, all proponents of survivability require some form of dualism. If there are *any* conditions of truth, and if the previous three laws of propositional logic are some of those conditions, then the proponents of survivability are committed to the existence of more than one kind of thing – a material body located in time and space, and something else.

The previously discussed issues of personal identity, and the mind/body problem, are crucial to understanding and evaluating claims concerning survivability. In order to understand the claim that “something else” survives death, we need to understand: what is an individual person? What is consciousness? And what is the relation between the body and the mind/soul/consciousness?

Darwin's three arguments for extreme materialism provide strong grounds against survivability, and any other form of life after death. Given his philosophical assumptions and his claims - that cell division of single cell organisms is strictly material; that the relation between parent and offspring is one of numerical identity of parts; that consciousness is heritable; and that the difference in mind between higher and lower organisms is one of degree, not of kind – then a person is identical with their material body, and there is nothing else. Rather than maintaining that the body (brain, nerves) and soul (mind, consciousness) are separate entities that suddenly appear during the history of life on earth, and that somehow engage in a mysterious causal relation, T/E supports the position that each person is strictly, and only, a living material body that eventually dies forever. Consciousness ends as the causal relations of strictly material body parts discontinue.

D) Freedom of the Will

"Although each modification must have its own exciting cause, and though each is subjected to law, yet we can so rarely trace the precise relation between cause and effect, that we are tempted to speak of variations as if they arose spontaneously. We may even call them accidental, but this must be only in the sense in which we say that a fragment of rock dropped from a height owes its shape to accident."

(Variation II, p.416)

“Throw up a handful of feathers, and all must fall to the ground according to definite laws; but how simple is this problem compared to the action and reaction of the innumerable plants and animals which have determined, in the course of centuries, the proportional numbers and kinds of trees now growing on the old Indian ruins!”

(Origin, p. 83, 1st)

What is the difference between a feather and a person? A person can defy the wind and walk into it, or find a tree and hide from it, or build a wall and stop it - a feather can't. As a strictly material body, and as a vector of air currents, the feather and wind are instances of general causal laws concerning mass, weight, heat transfer and pressure. A feather is not conscious, whereas a person understands general principles, deliberates upon options, makes decisions, acts as a causal agent in the real world, and is held responsible by other persons. Unlike the feather, a person is held accountable for certain actions because of deep personal and social convictions that a person “could have done otherwise.” Proponents of free will claim that, along each of the steps of action, other courses of action are possible; that a person's free will has causal influence in that course of action; and that persons are morally responsible for their actions.

As with so many issues in philosophy, the notions of free will and moral responsibility are closely bound to the previously discussed concepts of consciousness, personal identity, mind/body relation, and causation. Positions on these concepts will affect a position on freedom. Darwin's contribution to the discussion of moral responsibility lies in his claims that human beings are instances of the general principles of T/E, and that humans have literally descended from much lower creatures according to those principles.

The above quote refers to the nearly unfathomable complexity of causal relations between the living organisms, including humans, in any current state of affairs. As individuals within states of affairs, each of us participate in this enormous causal chain. Darwin's T/E has significant consequences on questions of free will and moral responsibility because it claims to identify the origin, the causes, and the ontological status of our body parts.

Darwin was a keen observer and fully aware of the wide range of human sensation, emotion, religious and moral conviction, and other instances of consciousness. He also observed and gave many examples of consciousness, and social, and he thought, moral behavior in other species - intelligence and playfulness in ants, language and architecture in bees, deliberation and affection in

birds and snails, spiritual convictions in dogs, and altruism in apes. The main claim of Darwin's T/E is that the similarity between very different organisms is caused, not by the will, plan, or design of god, but by the descent of all current organisms from a common ancestor. T/E implies that rudimentary forms of consciousness, moral sentiment, deliberation, and will have been passed from parent to offspring for millions of years.

The previous three arguments for extreme materialism also apply to the issues of freedom of the will and moral responsibility. Darwin's T/E claims that the cell division of single cell organisms is strictly physical; that the reproduction of multiple cell organisms is also strictly physical; that an offspring of any organism is numerically identical with part of its parent, that consciousness is heritable; that the difference in mind between human beings and other members of the class of vertebrates is one of degree, not of kind. These claims entail a numerical identity of body (brains, nerves) and mind (soul, consciousness). The shared locations in time and space are necessary and sufficient conditions of numerical identity. Only entities that share location in time and space can be numerically identical, and only material bodies satisfy those conditions.

Darwin maintained that every organism, without exception, is an instance of the general principles of T/E. In order to be an instance of a general principle, an entity must be identifiable. According to Darwin's principle of identity, only material bodies are identifiable. As the above quote indicates, a feather is a material body which is an instance of general causal laws that govern its motion. With even greater complexity, every organism that populates the old Indian ruins, including any human at the time the ruins were occupied, is governed by its conditions of life and by the general causal laws of T/E. The fact that some of the individuals are conscious, deliberate, have sensations, emotions, and make decisions, does not make them any less subject to these laws.

As single cell organisms gradually evolved into complex multiple cell organisms, organisms gradually became conscious and self-conscious. Consciousness is not a thing, it's not a non-material entity that suddenly started to exist in relation to a body. Rather, consciousness *is* the body, it *is* the complex relation of nerve cells, brain cells, synapses, electrical charges, blood, and fluid that is passed from parent to offspring. According to T/E, deliberations, choices, and acts of will, are physical entities that are identifiable instances of causal relations. As instances in the causal chain, the parts of the body that make up consciousness are subject to the necessity of general causal principles. This complex web of particles and relations are both caused to occur by previous conditions, and are themselves causes of future conditions.

The main problem for advocates of free will is the logical requirement for distinguishing an individual with free will from an individual without free will. Several dualist theories of freedom attempt to identify moral agents as somehow separate and independent of the general causal laws of time and space. One theory identifies the free part of an agent as a mind, soul, or spirit that exists separately, yet is related to the material body, and is the entity that makes decisions and is responsible for actions. Another attempt at explanation of moral action is Strawson's person theory by which mental predicates and material predicates are ascribed to the same individual called a person. His precept "the concept of a person is primitive" summarizes the position that the criteria for distinguishing moral individuals is learned by means of learning language. As previously discussed, Strawson's person theory fails because the properties of consciousness fail to satisfy his own principle of identity. Property dualism is dualism. The non-material properties of consciousness are identifiable and re-identifiable only if they are numerically identical to material bodies.

As for moral responsibility, advocates of free will claim that the agent is somehow independent of causation, and is not bound to the previous conditions of the causal chain. A person is morally responsible for actions because, regardless of previous conditions, an agent with free will "could have done otherwise", that is, the agent is capable of uncaused action or self-caused action. Darwin's T/E, on the other hand, maintains that consciousness, deliberations, choices, and moral sentiments, are themselves a complex web of particles that are parts of the causal chain. T/E maintains that individuals could have done otherwise only if the preceding conditions were otherwise. And those conditions could have been otherwise only if their previous conditions were also otherwise, ad infinitum into absurdity. A moral agent could have done otherwise only if everything would have been otherwise.

Much depends on the ontology of consciousness, and what it is to be an instance of a causal relation. The materialism of T/E argues that consciousness is an identifiable material passed from parent to offspring, while the advocates of free will require a special status of ethereal entities from another realm. What is the difference between a feather and a person?

E) Existence of God

"My dog, a full grown and very sensible animal, was lying on the lawn during a hot and still day; but at a little distance a slight breeze occasionally moved an open parasol, which would have been wholly disregarded by the dog, had anyone stood near it. As it was, every time that the parasol slightly

moved, the dog growled fiercely and barked. He must, I think, have reasoned to himself in a rapid and unconscious manner, that movement without any apparent cause indicated the presence of some strange living agent, and that no stranger had a right to be on his territory.”

(Descent, p. 118)

Although sometimes amused by the ridiculous antics and strange appearances of various creatures, Darwin was always keenly observant, strictly literal, serious, and sincere. This example is no joke, it is intended to reveal a specific instance of consciousness and rationality shared by dogs, humans, and many other creatures. A multitude of creatures are deeply focused on identifying the causes of facts (sounds, smells, movement), and their lives depend on whether they are right or wrong.

The entire purpose of Darwin's Argument is to correctly identify the cause of certain facts. His understanding of religion, and each theory of creation, was comprehensive, and he sought to show that whatever god of whatever religion was *not* a cause of those facts. Darwin concluded that the cause of these facts is descent from a common ancestor. Given his philosophical assumptions and his theory of pangenesis, he further concluded that the cause of his facts is a material particle developed according to the principles of T/E and passed from parent to offspring, through untold generations, by means of ordinary reproduction. His theory entails that god is not the cause, and further, cannot be the cause, of any forms of life on earth.

The moves from “X is not a cause of fact Y”, to “X cannot be a cause of fact Y”, to “X does not exist,” are obscure and not obviously valid. However, it seems to me that the moves are valid and grounded on these reasons:

- “X is not a cause of fact Y” is true for the reason that tests, predictions and convergence provide evidence that a particular not-X is the only cause of fact Y;
- “X cannot be the cause of fact Y” is true for the reason that X cannot, in principle, be distinguished from not-X;
- “X does not exist” is true for the reason that identifiability and re-identifiability in time and space are necessary and sufficient conditions for existence, and X is not identifiable nor re-identifiable.

Darwin's arguments for extreme materialism also add force to the claim that there is no god - that cell division is strictly physical; that parts of the parent and offspring are numerically identical; that consciousness is heritable; that no kind of entity suddenly appears; that the difference in mind between simpler and more complex creatures is one of degree, not of kind - all support the claims that

only material bodies exist, and that gods, spiritual agents, mental entities, and any other non-material causes do not exist. The creeds, rituals and promises of all religions crumble to the ground if Darwin's T/E is true. If T/E is true, then there is no god, period.

In conclusion, these A-E implications of extreme materialism are in grave conflict with most people's lives and values. To many people, extreme materialism renders life devoid of purpose and meaning. To many, the rigid, causal relations connecting them to early ancestors of the ancient past, and strict limits on spiritual and mental entities, seem dark, hopeless, counter-intuitive, and simply wrong. There must be more to life. But wishing doesn't make it so. T/C also has severe consequences for these same issues of philosophy, and these consequences may also be unpalatable.

Extreme Dualism

Extreme dualism is a theory about the nature of reality, including claims concerning what kinds of things exist and how these kinds of things are related. The fundamental positions of dualism are that both material and non-material entities exist, and that both material and non-material entities are related as instances of general causal principles that are true. As previously mentioned, particularly in relation to T/E and T/C, the reasons I call these theories "extreme" are that the sets of beliefs are exclusive to each set, contradictory to the other set, and that there are no counterexamples between sets.

These are the main arguments for dualism:

Argument 1

Most human beings have an intuition and strong feeling that there is a gap between body and mind; between stimulation (touch stove) and sensation (feel pain); between body state (drink water) and mental state (quench thirst); between words ("tree") and meaning (necessary and sufficient conditions for being a tree); between deliberation (do I want bacon or sausage) and choice ("bacon, please"); and between perception (crash) and reality (tree falling). This gap cannot be closed because the two things are not identical, one thing is physical, and the other thing is mental.

Sentences about consciousness are not reducible to sentences about the brain. If consciousness and the nervous system were identical, then statements about one must be true of the other, but that's not the case - the taste of chocolate has nothing to do with the fluids and grey matter in your head. The activity of our brains and nerves can't fully account for the flavors, smells, sense of beauty, and sense of guilt, that float through our consciousness. Whether explained by substance dualism, property dualism, or another theory, these sensations, emotions, and reasons, are things or entities that instantiate general causal principles. Sensations, emotions, and reasons, are causes of actions and feelings between objects of the physical world and objects of the mental world, and each are instances of the laws of nature.

Argument 2

Certain sources of authority are necessarily true and cannot be questioned. Religious texts (Bible, Qur'an, Upanishads, Sutras), political texts (U.S. Constitution) political/cultural leaders (dictators, preachers, prophets) make claims that serve as fundamental premises, and truth is determined by coherence with those claims. This position limits the states of affairs assessed by a correspondence theory of truth, and rather, applies a coherence theory between figures of authority and reality. While daily life and ordinary conversation applies a correspondence theory of truth, the claims of authority – often including a form of T/C – assert or assume dualistic, non-material entities and non-material causation. Since these claims of authority are assumed true, the believer need only make claims that cohere with the authority, not with reality.

The convictions of the believers of sacred texts are so strong that questions concerning the existence of their non-material entities and evidence for non-material causation, are unable to penetrate and examine for truth. This argument denies our goal of analyzing T/E and T/C using the same philosophical assumptions, so belief becomes an impasse for truth. Also, this argument leads to inconsistency when two or more sources of authority make incompatible claims about supernatural existence and supernatural causation. The gods of the Bible, Qur'an, Upanishads, Sutras, Greek mythology, Native American creation stories, U.S. Constitution, and more, are different gods, and this argument leaves only comparative strength and war to resolve the dispute.

Argument 3

Dualism has to be true because materialism entails philosophical consequences that are false or unacceptable. As previously described, materialism entails that; there is no god; there is no life after death; there is no free will; the body and mind are identical; you are only your body; and only material bodies are causes. Dualism has to be true because the implications of materialism are bleak, depressing and unbearable. Since materialism is false, the negation of materialism must be true.

Implications of T/C

“Several eminent naturalists have of late published their belief that a multitude of reputed species in each genus are not real species; but that other species are real, that is, have been independently created. This seems to me a strange conclusion to arrive at.....Nevertheless they do not pretend that they can define, or even conjecture, which are the created forms of life, and which are those produced by secondary laws. They admit variation as a vera causa in one case, they arbitrarily reject it in another, without assigning any distinction in the two cases.”

(Origin, p. 503, 1st)

As previously discussed, T/C has many forms and it's easy to get lost in the details of each form. This quote helps sort out and evaluate the fundamental claims of any T/C. T/C claims; first, that more than one kind of entity exists - one is material, physical, and subject to natural law, and another is non-material, non-physical, mental, and not subject to natural law, and, second, that this "other" kind of entity participates in the causal chain as instances of general principles that are true - either as cause, or as effect, or both.

Darwin argues that these dualist entities are not identifiable, and that these entities do not, and cannot, participate in the causal chain related to his facts. T/C, on the other hand, argues that these "other" things do participate in the causal chain, and do explain Darwin's facts. This dualism of T/C has significant implications for each of the A-E philosophical issues as previously discussed in relation to materialism.

A) Mind/Body Problem

On its face, T/C does not seem to take a position on the mind/body problem – a person could be strictly material and still be in a causal relation with god. However, the strong positions T/C takes

on personal identity, life after death, and freedom of the will, certainly push T/C into a dualist position on mind/body. For all practical purposes, T/C entails a separate and distinct status for consciousness and its relation with the human body. This distinction between mind and body is a necessary condition for establishing a difference between human beings and other living and non-living entities. T/C maintains that humans are special creatures and the property that distinguishes them from other entities is a mental/spiritual part. The mind and the body are not identical. Whereas T/E is compatible with the mind/brain identity theory, T/C is not compatible.

B) Personal Identity

Different forms of T/C put different amounts of value on one's own physical human body; to many, the body is a temporary vessel of affliction and suffering set free at death; to many, the body is less real and less significant than the self/spirit/soul that somehow joins with the body and makes us who we are. The body ages, decays, falls apart, while the soul develops character, thinks, and is permanent. From day to day and year to year, the body changes, but the soul stays the same.

In relation to Darwin's Argument, T/E entails a numerical identity between a person's body and consciousness, a body and soul are one thing located in time and space; whereas T/C entails that a person's body and consciousness are more than one thing, and that these things are in some sort of relationship.

It's hard to over-emphasize the issue of personal identity when evaluating the truth of T/E and T/C. The beliefs you have really matter, and no person or thing is more deeply affected by your convictions than you are. At no other point in philosophy are such radical consequences at stake, and yet at the same time, at no other point is it harder to both determine, and accept, the difference between what seems to be true, from what is true. Are you one thing, or more than one thing?

C) Life after Death

The many variations of T/C also yield many claims about the nature of death and survivability. The philosophical issues of mind/body, and of personal identity, provide the grounds for claims concerning life after death. T/C claims that consciousness, aura, mind, spirit, soul, and energy are entities, or parts of entities, that can survive death. This consequent of T/C is most clearly stated

at the burials, funerals, memorials, and other rituals of its many forms. The deceased are often referred to as existing things that have departed, joined ancestors, and somehow moved on to a different kind of life.

At no point in our lives is the influence of emotions and human social relations more apparent. The sadness, sense of loss, and need for hope make inappropriate and nearly impossible to ask: is it true?

D) Freedom of the Will

Most, if not all, T/C's claim that persons are responsible for some of their beliefs and some of their actions. Yet, they would not say this of a feather in the wind. Something about a person's consciousness, decision-making, and sense that an individual "could have done otherwise", seems to make a human being a special entity. Even in situations of extreme natural disaster – fire, flood, earthquake, tornado, disease - humans are considered morally praiseworthy if they deny those forces, and fight for their own and other's survival. Feathers don't deny nor fight the wind, yet, humans do.

What is the difference between a person and a feather? T/C claims that the difference is ontological – persons are a different kind of thing that has a different part. That different part is "freedom of the will," and the status of that part greatly affects what counts as an instance of a natural law. The issues of freedom and moral responsibility examine the ontological status of individuals, and question whether persons are instances of causal principles. T/C's commitment to freedom also commits the theory to a form of dualism between individuals that are free, and individuals that are not-free. As expressed in Darwin's above quote, the philosophical issue arises - what are the criteria, the conditions, for distinguishing the individuals with free will, from individuals without free will?

E) Existence of God

T/C's commitment to the existence of some non-material/spiritual/supernatural kind of god/entity/force/energy in the universe, is a fundamental premise of T/C and not really an implication. Although the variations of T/C are numerous and conflicting in how they explain Darwin's facts, each makes two fundamental claims. The first claim concerns existence; that the Creator exists and is distinct from what is not the Creator - the rest of the world - the objects of creation - living and non-living things.. The second claim concerns causation; that the Creator is an

instance of a general causal principle that is true - the Creator is the cause of facts/events in the world.

These claims about god certainly entail a kind of dualism. Whether the dualism is extreme, that is, whether T/C and T/E are incompatible and without exception, will depend on philosophical assumptions. I have tried to show that Darwin's Argument requires that T/E and T/C share the same assumptions.

Summary of implications

This comparison of the implications of T/E and T/C highlights the importance of understanding Darwin's Argument and his philosophical assumptions. The comparison of T/E with T/C has forced us into the age-old dispute between materialism and dualism. At the heart of this dispute is a set of assumptions over which, it seems, individual persons have no choice – you either have them or you don't – they make sense, or they don't make sense.

We have a faceoff between two very fundamental and incompatible perspectives of life on earth – or life anywhere. Darwin himself recognized this clash and was hopeful that T/E would prevail:

“Although I am fully convinced of the truth of the views given in this volume...I by no means expect to convince experienced naturalists whose minds are stocked with a multitude of facts all viewed during a long course of years, from a point of view directly opposite to mine. It is so easy to hide our ignorance under expressions as the “plan of creation”, "utility of design”, etc. and to think we give an explanation when we only restate a fact. Anyone whose disposition leads him to attach more weight to unexplained difficulties than to the explanation of a certain number of facts will certainly reject my theory... but I look forward with confidence to the future, to young and rising naturalists, who will be able to view both sides of the question with impartiality.

(Origin, p. 503, 1st)

However, Darwin was wrong, the world did not go his way. Although T/E has had overwhelming success at explaining facts concerning living things; by identifying the principles that form the foundations of all branches of biology – genetics, neurology, medicine, botany, and more; by making predictions about the relations between organisms and their conditions of life (genetic

modification, epidemics, extinctions); by conducting tests and collecting evidence which show beyond a reasonable doubt that the principles of T/E are true; still, the great majority of people – even the great majority of medical doctors, scientists and philosophers – believe that both T/E and T/C are true, or can be true. Few accept the severe implications of Darwin's Argument.

The main reason T/E does so poorly in the court of public opinion is not a matter of truth, it's not because Darwin got his facts wrong, or his theory wrong. I'm not aware of any thinker with such a large collection of facts at hand, with such an open and curious mind, that has proposed such a deeply strange explanation for those facts. It's not that Darwin's T/E was wrong. The main reason for the broad rejection of Darwin's Argument, and its implication of extreme materialism, is that humans are inconsistent in their commitment and application of philosophical assumptions.

Let's say you and I agree on these facts: we're in my kitchen in my house near Big Timber, MT. There's a table in the kitchen, with an apple on the table. It's the same apple that I bought at the Big T IGA yesterday. We decide to eat the apple and agree: it's crisp and sweet.

It seems simple and obvious, but to reach an agreement about the facts of this case - you, me, the house, the kitchen, the table, the apple, the decision, the flavor - you and I must apply the same assumptions of logic, truth, knowledge, identity, causation, and evidence. Yet, we can't agree on the origins of human beings and apples. Why is it so hard to believe that you, the apple, and I descended from a common ancestor? Why is it so hard to believe that at a specific point in time, and in a specific location on earth, you, that apple, and I had the same parent? Why is it so hard to believe that part of you, part of the apple, and part of me, are numerically identical?

It's not because these beliefs are false, in fact, Darwin makes a convincing case that they're true. Rather, the reason these claims are hard to believe is that they're outrageous and weird. The time is so distant, and there have been so many changes on earth, that we have lost track of our origins.

Even many religious fundamentalists seem to accept some of the facts of reproduction between their mothers and their fathers, the transfer of genetic material when their father's sperm unites with their mother's egg, and the laws of growth of their embryos between conception and birth. The philosophical assumptions that identify the facts of each moment in time of the development of that individual are acceptable. Perhaps the similarity of appearance, organs, behavior, and intelligence between the parents, grandparents and great grandparents of that religious individual are also acceptable. The implausibility of descent arises as organisms change forms and parts through great reaches of time. However, whether plausible or not, if T/E is true, the principles that cause the

appearance, organs, behavior, and intelligence of any current offspring are the identical principles causing the appearance, organs, behavior, and intelligence of any offspring, of all creatures, through all time, without exception. Like it or not.

If the question is truth, the answer is limited by reality. Philosophy has long sought to examine, describe and understand the limits of reality, and the consequent understanding of these limits is based upon certain assumptions of language, experience and rationality. Without assumptions, no examination nor formulation is possible. As Strawson argued, in order to question assumptions, assumptions must be made.

Although any view of reality is taken from a certain perspective, and that perspective is based upon assumptions, this does not mean nor imply that each perspective is equally valid. Some are right, and some are wrong – materialism and dualism cannot both be true. I would argue that in order for assumptions to be true and correct, they must be consistent with other assumptions, and consistent with how they are used. For example, if Darwin's principle of identity is used to distinguish a bird from a not-bird, or a spore from a not-spore, then the same principle should be used to distinguish a god from a not-god, or a sensation from a not-sensation. The same requirement for consistency goes for the theory of causation; if the principle of identity obtains for one set of causal instances, then the same principle of identity must obtain for other sets of causal instances.

These requirements of consistency between assumptions, and consistency of their application, apply to all of Darwin's assumptions of logic, truth, knowledge, identity, causation and evidence. I have tried to show that Darwin did make these assumptions and that they do satisfy the requirements of consistency.

The problem with T/C, is that either it uses different philosophical assumptions or, if the assumptions are identical, it applies the assumptions inconsistently.

If using the laws of propositional logic, even god cannot be both god and not-god.

If using the correspondence theory of truth, then holy texts have no special status. The authors had the same conditions of truth and evidence in 400 BC, as the proponents of T/C have in 2019 AD.

If using a realist theory of knowledge, then the structural framework of reality is knowable, claims to fact are knowable and subject to justification.

If using a realist principle of identity, then god must be distinct from not-god, one god must be distinct from other gods, and the same god must be re-identifiable at different times and spaces.

If using a realist theory of causation, then both the cause and the effect must be distinct and identifiable, god must be distinct from the burning bush, and distinct from the religious experience of the believer.

If using a realist theory of evidence, then claims to causation must be justified by separate and independent claims.

Consequently, the proponents of T/C must either make these assumptions, or they don't. If they do make the same assumptions, and they come into conflict with other claims (either from T/E, or a different T/C), then they must demonstrate the truth of their claims. If they don't make the same assumptions, then they must justify the different assumptions. In either case, the burden of proof is on the proponents of T/C.

When two theories attempt to explain the same fact, and if those explanations are incompatible, then those theories cannot both be true. When Darwin proposed his T/E, he did not simply claim that his general principles explained his sets of facts, he also claimed that the general principles of T/C did not explain those facts. He believed that T/E and T/C are incompatible and that claims of T/C, if true, would be "fatal to my theory". I have tried to identify the philosophical assumptions upon which he based this claim of incompatibility.

We still debate the nature of each assumption (Donald Trump's claims that facts about his corruption are "fake news", climate change deniers' claim that evidence concerning the causes of climate change is insufficient), and we can't avoid making commitments. Your assumptions will greatly affect your position on the truth and compatibility of T/C and T/E. The conflict between T/E and T/C is as fierce and controversial now as it was during the Battle of Oxford (1860), the Scopes Trial (1925) and the Dover decision (2005). The main difference between Darwin's time and current time, is the enormous success of T/E. This success at explanation, the correctness of predictions, the discovery of new facts, and the unifying of various disciplines under the same principles, has shown that T/E is true beyond a reasonable doubt. T/E is not "just a theory", T/E is a true theory.

In philosophy, I think we can go one step further: this success also justifies Darwin's assumptions. The correct identification of causes over wide ranges of facts, and the accuracy of predictions concerning past and future life on earth, are overwhelming evidence that his assumptions on logic, truth, knowledge, identity, causation and evidence correspond to the structure of reality. Regardless of the language, laws, and religions of any culture - anywhere and anytime - Darwin was right – T/E is true, and T/C is false.

In challenging the truth of T/E, or in proposing that both T/C and T/E are true, the proponents of T/C must evaluate the underlying assumptions, and show that these assumptions are somehow incorrect, wrong, misleading, inappropriate, or false. Whereas Darwin did carry the burden to show that his argument succeeds, the proponents of T/C must now carry the burden and show that Darwin's Argument fails.

Section VI:

Summary and Conclusions

Since 1859, the term “evolution” has permeated discourse with reference to the ways many things change through time – the evolution of the computer, the evolution of the free market economy, the evolution of space travel. We define “evolution” by going through our historical records, finding the specific point in time and space where that object, process, or idea was first built, used, or introduced and then showing how it was developed through time. By tracing its changes, we understand it and make it intelligible.

In The Origin of Species, Variation of Plants and Animals under Domestication, The Expression of Emotions in Man and Animals, and The Descent of Man, Charles Darwin uses this same strategy to understand, make intelligible, account for, and explain, the similarities and dissimilarities between living things. Even in his youth, he recognized that there are different kinds of dogs, cows, sheep, and cabbages, and that farmers could select some parts of organisms and reject other parts. He sought to understand this relation between parts, and identify the point in time and space where any particular group of organisms would begin, and why. He sought the origin of species, and discovered that the similarity of parts between very different creatures was caused, not by a plan nor by sudden creation, but by descent from a common ancestor. All species descended

gradually from other species, and each individual is an offspring whose parts are inherited from its parent in an unbroken chain of ordinary generation from the beginning of life on earth.

Darwin's own understanding of evolution gradually evolved. He spent nearly 30 years of intense research, world travel, and data collection before publishing his great theory. He understood the severity and extreme consequences of this theory well enough to refrain from publishing until he had very thorough justification. When released, The Origin of Species shook the foundations of religion and science, forced an evaluation of god and a radical reconsideration of mankind's place in the world. In one solitary life, he provided strong evidence that nearly all humans at the time were wrong.

The surveys of social research show that from country to country and culture to culture, there is no consensus on the truth of T/E and T/C. In the United States, between 81% and 87% of Americans either reject Darwin's T/E, or believe that both T/E and T/C are true. (The Reluctant Mr. Darwin, by David Quammen, p. 15). The 2005 District Court case of Kitzmiller vs. Dover Area School District et. al. shows that, at very high levels and between very intelligent persons, there are profound commitments to different and incompatible explanations of facts.

Darwin himself was deeply committed to the truth of T/E. He could have stopped there - collected his data, made his predictions, and provided his evidence that current organisms descended from previous organisms - but he didn't stop there. He was also deeply committed to the falsehood of T/C.

Was Darwin right? I think so. The purpose of this essay has been to formulate Darwin's Argument, identify his philosophical assumptions, and examine the implication of those assumptions. His Argument is straight forward and without clever deceit:

1. T/E does explain facts.
2. T/C does not explain facts.
3. Therefore, T/E is true, and
4. Therefore, T/C is false.

I have tried to clarify what Darwin meant by “fact”, “theory”, and “explain”.

A fact is a state of affairs that exists.

A theory is a set of general principles of which facts are instances.

An explanation is an attempt to identify the cause(s) of a fact.

In order to understand Darwin and to determine whether he was right, it is essential to realize that he applied the same conditions of truth to both theories. A necessary condition for comparing T/E and T/C is that both endeavors use the same facts, the same concept of theorization, and the same concept of explanation. From the onset, I have had to recognize that satisfying these conditions is a tall order – the diversity of human thought, reasoning and culture is staggering. What makes sense for one person makes no sense for another.

However, Darwin's own life was quite remarkable. He experienced first-hand the great differences between people and their places; he had a deep understanding of Christianity and other world religions, and a significant familiarity with philosophy. He understood T/C, and rejected it.

Unlike the Ten Commandments written on a stone tablet and presented to Moses by God, theories which attempt to identify the causes of facts do not fall from the sky - they are formulated by (mostly) rational human beings. It's true that evolution is “just a theory,” but it's also true that religion is “just a theory” - both make claims to causation in order to explain facts. The hard part is determining whether the theories are true. All theories make assumptions, and to compare them and evaluate truth, requires that some of these assumptions are shared.

In the case of Darwin's Argument, the assumptions precede the theory, and affect the comparison of T/E and T/C. The argument begins with the tacit agreement that both theories share the same assumptions. I have tried to identify the assumptions that Darwin brings to the argument, and determine whether his comparison between T/E and T/C is justified.

While developing T/E, Darwin is committed to these assumptions:

1. Correspondence theory of truth: truth consists of a correspondence between language, thought, and reality, in which proposition “x” is true if and only if x.
2. Realist theory of knowledge: knowledge is justified true belief, and reality has a structural framework of general laws that are known to be true or false by means of sense perception, generalization, and laws of propositional logic.
3. Laws of math and logic: certain laws of mathematics and propositional logic correspond to the structure of reality.
4. Realist principle of identity: individual x exists if and only if x is identifiable and re-

identifiable in time and space.

5. Realist theory of causation: causation is a relation of necessity between things that exist, and reality has a structural framework of general causal laws of which facts are instances.

6. Realist theory of evidence: evidence is a fact which identifies a causal relation between separate and independent facts. Tests, predictions and convergence of facts provide evidence for the truth of general principles.

Many people disagree with Darwin's Argument. In examining this argument and its assumptions, I have tried to show that:

Either,

A. the premises of DA are true, and the argument is valid,

Or,

B. T/E and T/C have different assumptions.

If A, then T/C is false and should be abandoned. If B, the proponents of T/C have the burden of justifying their assumptions. In either case, the consequences of Darwin's Argument are very harsh for T/C.

Although DA is short and simple, the justification of each premise is extremely complex, controversial and took Darwin a lifetime to demonstrate. In developing the first premise, it's important to keep in mind that Darwin selects the facts. The list is long and comprehensive, but only some facts are addressed by T/E – certain facts from geology, geography, morphology and embryology. He then proposes a set of general principles – ordinary generation, inheritance, variation, natural selection and modification – and argues that these principles explain these facts by identifying the causes of facts. Darwin maintains that tests, predictions, and convergence provide evidence that the general principles of T/E are true. Between 1859 and the present, evidence has shown that T/E is true beyond a reasonable doubt.

In developing the second premise, Darwin examines the same sets of facts, and claims that the principles of T/C do not explain these facts. The principles of T/C do not explain facts because god is not identifiable as a cause, one god is not distinguishable from another god, and tests, predictions, and convergence provide insufficient evidence to justify claims to truth. In essence, the conflict

between T/E and T/C boils down to identifiability and evidence - T/E does have identifiability and evidence, T/C does not have identifiability and evidence.

Given Darwin's assumptions, the claim that both T/E and T/C are true, is contradictory. If T/E is true, then T/C is false.

However, concerns other than truth affect our deeply held convictions. The implications of a set of beliefs also influence their acceptability. T/E entails extreme materialism, and T/C entails extreme dualism. Darwin's arguments for materialism; that cell division of single cell organisms is strictly physical; that some parts of the offspring are numerically identical to some parts of the parent; that multiple cell organisms descended from single cell organisms; and that the difference in mind between upper creatures and lower creatures is one of degree, not of kind; imply that only material bodies exist, and only material bodies are instances of general causal principles. The implications are daunting: if T/E, then; the mind and body are numerically identical; you are only your body, and you have no soul; there is no life after death; there is no freedom of the will; and there is no god.

The implications of T/C are appealing and liberating: if T/C, then; your body and mind are distinct and separate; you are your body and your soul; your soul can survive death, and join your family forever; you have free will, and you can choose your identity and destiny; and there are many gods, and you can chose any god you want. The appeal of T/C is that it is not limited by reality, all you have to do is believe, surround yourself with like minds, cohere to each other's claims, and follow the rules established by the group.

The problems with any theory arise when its claims come under dispute. The process of justification is required when the believer is called upon to show that their theory is true. If the claims in the dispute are logically incompatible, and our lives are deeply affected, then the burden of each theory is to identify the entities, and provide criteria for determining whether claims to causation are true. In Origin, Variations, Expressions, and Descent, Darwin clearly made his case for the truth of T/E, and provided his evidence.

T/E is a deeply strange and frightening challenge to every person's identity. Darwin's Argument was immediately taboo upon publication and the American education system has rejected it - we were not taught Darwin's T/E in high school, nor at the university. We were taught only a partial and modified version of T/E. In our short lives we must make decisions about ways to fit into our societies, ways to make a living, who to make a partner, how to raise children, what's right and what's wrong, what's true and what's false. T/C and its dualism have so permeated our language and

understanding, that it will forever influence most peoples' ordinary lives - humans need gods, immortality, and freedom - but these convictions are false. We occasionally have insights into how the principles of T/E cause antibiotic resistant bacteria, why DNA tests are used to identify victims of natural disasters, or how to produce some sheep with black wool, and some sheep with white wool. However, we rarely apply these same principles to ourselves.

What made Darwin so unusual and profound was that he applied the principles of T/E to all living things, our selves included. Humans are organisms that literally share parts with very simple creatures from the very distant past. Somehow, it's not troubling to accept that I share parts with my parents, and maybe some parts with great grandparents. But eventually we lose track of our immediate family. The memories are faded, the times change.

Darwin's great vision, and the strange implication of T/E, is that, through immense periods of time, and changing conditions of life on earth, we share parts and have numerical identity with very different creatures. We share ancestors, and consequently, minute particles, with each walleyed pike in Minnesota, each Ebola virus in Africa, and each mushroom in the grocery store. T/E implies that the chain of shared parts between you, your parents, grandparents, and some ancient single cell organism floating in a warm shallow sea, are instances of an unbroken chain of ordinary generation. Each of us is an inevitable consequent from long ago, determined by our conditions of life, and the general principles of T/E. The relation of descent between you, your dog, and your houseplant, is a matter of fact. A preponderance of evidence demonstrates beyond a reasonable doubt that T/E is true - all current living things descended gradually from one or a few single cell organisms.

This tiny numerical identity between current living things sounds mystical, but it's the exact opposite. In Variations, Darwin goes into considerable detail in examining his evidence for the theory of pangenesis. He recognized the bizarre nature of his claims, yet he followed the evidence and made the risky speculations of extreme materialism. Pangenesis claims that the cell division between parent and offspring is a relation of numerical identity, through which a material part of the parent becomes the offspring, and that material is again passed on to the next generation of offspring, and on and on through untold generations. Darwin's philosophical assumptions both led him, and forced him, to claim that, though unfathomably diverged, current organisms still carry a tiny, influential, material particle of life from earth's few, original, single cell organisms.

Throughout human history, people have flocked to T/C for hope, relief from suffering, everlasting life, freedom, the purity of a divine world, and explanation of mystery. Darwin knew that

most people would be repulsed by the bleak and deterministic status of descent from low and simple creatures. According to T/E, humans are neither exceptional nor special, we are equal links in a long chain of prior causes. Darwin understood this equalization and had this advice:

“When I view all beings not as special creations, but as the lineal descendants of some few beings which lived long before the first bed of the Silurian system was deposited, they seem to me to become ennobled....As all forms of life are the lineal descendants of those which lived long before the Silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. Hence, we may look with some confidence to a secure future of equally inappreciable length.”

(Origin, p. 513, 1st)

Darwin concluded the great Origin by predicting that life on earth will go on for a very long time, but he didn't speculate on the details. From our short perspective, a lot has changed since 1859. The human race has been enormously successful, we have evolved to dominance, we live in every corner of the earth, and we take everything the earth has to offer. We modify genes, smash atoms, send cameras deep into our small galaxy, and change the earth's climate. However, if T/E is true, and it certainly is true, we too will someday go extinct.

Darwin argued that progress is not necessary - there is no guarantee that any creature that follows us will review, understand, and accept Darwin's Argument any more than we do. Now is the time to accept it or reject it. Darwin made the case and showed that T/E is true. He also made the case and showed that T/C is false. The current burden of humanity is to accept T/E, and to reject T/C, in all of its forms of religion and spirituality.