

Realism in Science: Common Ground

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Abstract: Philosophy is the basis of all sciences, the foundation of knowledge that provides ultimate answers beyond the limits of science. Although scorned and spurned by science purists (which is partially justified by its modern errant versions), metaphysics and logic, especially, form a common ground of agreement and the tools for truth validation that is so obviously missing in theoretical analysis. We will propose a set of premises for use as a common world-view and then apply them to current science beliefs in order to demonstrate some common fallacies that commonly occur in establishment public beliefs and rational thinking. The intent is to build a solid common ground of tools and axioms based on philosophical realism and the scientific method for knowledge development by researchers.

1. Introduction

Philosophy is usually ignored, rejected, or despised by mainstream and dissidents alike. Establishment science mocks philosophy in its intellectual arrogance, a fault that reasonable people should be wary of. Misunderstandings and negative attitude based on modern philosophers is understandable – from Rousseau’s rationalism to Kant’s idealism and Nietzsche’s nihilism. But the underlying cause of all the distrust is a lack of understanding of the nature and value of a realistic philosophy in discovering truth – of all types.

It would be ideal for all to agree on a repository of philosophical principles, as a source of common-ground beliefs. Thereby we may avoid the common occurrence of dialogues that are doomed to fail. They start from unspecified definitions and assumptions, and use common logical fallacies in an attempt to carry a point across, which is based on their personal worldview. It is imperative that all worldviews and assumptions are known and disclosed in seeking scientific truth – even by those who deny they have any worldview or presumptions.

In the future, discussions, debates, and arguments can begin by laying out the fundamentals with a simple question: Do you subscribe to the philosophical standards of realism? If not, advancing further is pointless.

A situation to avoid is a physics – or any science – discussion or debate where it’s belatedly discovered that the issue is not physics, but divergent assumptions on metaphysics that prevents a common worldview. Does anybody believe in ignoring contradictions? Or that effects can occur without causes? Or that reality is subjective?

You might as well be speaking an unknown language to each other. But when you don’t have a common spoken language to communicate, you know this immediately. Why find out after several exchanges, or a half-hour discussion, that your correspondent believes contradictions can be ignored... or the vacuum in physics means what does not exist - nothing, rather than the absence of matter?

We all have a worldview that began in infancy, when our eyes told us an object was before us, and our hand confirmed its existence by touching, when we released an object and it fell to the ground, not to the sky, etc. The question is – do our mature worldviews agree now, after a lifetime of exploring and discovering, studying and wondering, or do we have our own personal and private images of the world, how it works, and why it works. Philosophy can help answer these questions, which are fundamental to progress in physics.

In praising science, it does not follow that we must adopt the very poor philosophies which scientific men have constructed. In philosophy they have much more to learn than to teach. Dean Inge

2. Hierarchy of Knowledge Domains (KD)

Knowledge Domains are the divisions of knowledge by subject and content.

A Knowledge Domain collects, processes and produces refined information about its own proper subject matter. As examples:

Philosophy has no limits in the material or immaterial worlds but is only limited to exclude religious subjects.

Theology also has no limits in its KD but focuses on the divine source.

Science is a KD limited to study of the natural world.

Physics is a branch of science which studies mainly energy and motion.

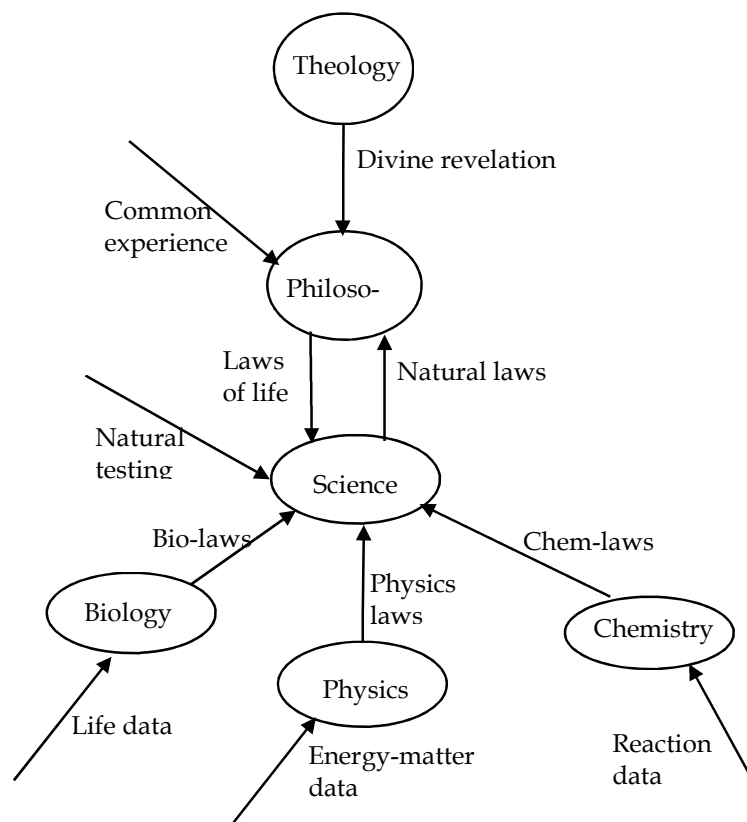


Fig. 1. The Hierarchy of Knowledge Domains - from the general to the specific

The breadth and limits of each KD is a fundamental issue to address, as outlined in Fig. 1 above. The complete span of human knowledge includes sources of truth beyond nature - the KD of theology.

Theology is the widest KD, allowing credible human testimony as well as sensory data to produce spiritual/divine knowledge. This is the highest level of KD, which defies Gödel's theorem(discussed later), by supplying knowledge only available to the creator and designer of reality, filling in axioms unknown and unproven at human levels of comprehension. It adds divine revelation to all human knowledge captured by -

Philosophy.

This KD consists of:

Input: Common sense observations from experience and human testimony

Process: Iterations of observations and rationalizing

Output: Laws or guidelines for living.... A worldview or *Weltanschauung*

Philosophy, like science, excludes preternatural or supernatural events – only events are processed that are based on shared human experience. Unlike science, philosophy accepts human testimony.

Science.

This KD further limits the scope of knowledge to the natural material world. Science is patently limited in its scope which excludes –

- **single non-repeatable events**
- **extra-natural or supernatural events – only physically measurable events.**
- **events not accessible for equivalent testing in space or time.... the basis of the scientific method(SM).**
- **human testimony**

Regarding independence from human testimony: science asserts that all theories must be testable, so individuals can test any claim that the majority propose. But this ideal concept of independent testing is simplistic and tied to pre-modern science, when lab experiments could be done by individuals to validate proposed theories. The size, scope and cost of resources to perform complex modern experiments is a practical prohibition against duplicating tests done by large corporations, academic research labs or government institutions.

Physics

For physics the process is shown in Fig. 2 and outlined below:

Input: Sense data from tests on energy and matter exchange

Process: Scientific method – iterations of tests and interpretations

Output : Natural laws or predictions

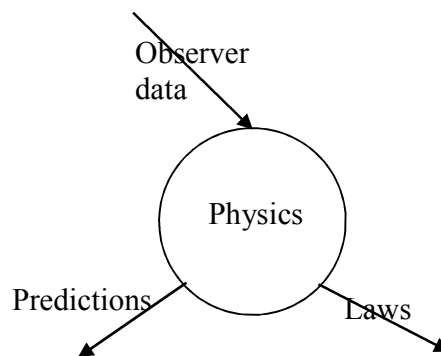


Fig. 2 Physics KD process

Physics is limited to only natural events and causes - unable to explain the difference between a living and dead animal, because it admits nothing of spirit, nothing beyond materialism, naturalism and scientism....all philosophies which underlie modern physics.

Another limit is the need for confirmation by repetition – which excludes singleton events.

Strictly and technically speaking, all events are unique, distinguished by time if not by space.

The formation of physical laws requires abstraction of certain features, and ignoring others. Deciding which characteristics are important in experimental testing is part of the subjectivism of physics. This weakness is barely acknowledged by mainstream mavens.

Human testimony is another invalid source of physical truth according to the scientific method, but the inability of individuals to perform complex and expensive tests forces physics – and all sciences – to accept human testimony – when published in relevant journals, after peer review by scientists. The problem is that the process may be poisoned by ideological priorities which supersede the self-testing requirement.

Despite all the self-imposed limitations in the physics KD scope, and its isolation from other KD, which produces knowledge blind spots when physicists step outside their own domain, physicists still make the claim that they are approaching a Grand Unified Theory- GUT or a Theory Of Everything - TOE. What chutzpah!

There are many other KD sources in science which also tap into natural data sources. And philosophical realism, which scientists reject in their ignorance of its benefits – or hubris, allows a much wider scope of inputs than physics.

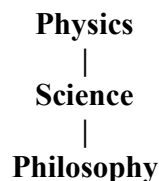
At one time the metaphysical assumptions of **pre-modern science** did coincide with realism. They include:

- there is an objective world external to the minds of scientists; this world is governed by causal regularities.
- the senses are capable of faithfully representing the world to the mind.
- the human intellect can uncover and accurately describe these regularities.

So, the hierarchy descends from theology to philosophy to science and physics, the lowest of the KDs available to mankind. This hierarchy is subject to a highly emotional condition – the battle between those who say there is no higher level than philosophy (or science), because there is no God.... and the theists.

The school of scientism ignores this outline and believes the disciples of physics – the lowest KD - are qualified to pontificate in the domain of philosophy and even theology (e.g., Big Bang).

To see the view of scientism, turn Fig 1 upside down.... and erase theology. This is the inverted pyramid of mainstream physics. ...



From the principle of sufficient reason (or causality) no KD can produce more information in its output than it receives as input data. That is, raw information is organized and converted to useful form. This is an example of philosophical reasoning based on the school of realism.

Sufficient Reason axiom: *Nothing can give what it doesn't already have...*

A cause cannot potentially produce more in the effect than it already has. Proverbially, you cannot get blood from a stone.

3. Brief History of Philosophy

A history of philosophy would best start with the Greeks, where we find many sources.

Golden Age of the Greeks

History is Philosophy teaching by examples.

-Thucydides

If you get a good wife you will become happy, and if you get a bad one you will become a philosopher.

-Socrates

There are in fact two things, science and opinion; the former begets knowledge, the latter ignorance. All things in moderation. -Aristotle

True science teaches, above all, to doubt and be ignorant. -Hippocrates

Middle Ages - Enlightenment

.....saw the rise of scholasticism, a form of moderate realism which revised Aristotle to agree with Christian theology.

The first perfection of being is existence. -Aquinas

This is an axiom in ontology, a branch of philosophy which studies being and its properties.

The principle of sufficient reason holds that for everything, there must be sufficient reason why it exists. -Aquinas

Entities should not be multiplied unnecessarily. -William of Ockham

Ockham's razor - in judging among competing philosophical or scientific theories, all other things being equal, we should prefer the simplest theory.

I think therefore I am. -René Descartes

...Descartes first doubted everything in order to figure out what he could know with absolute certainty. Although he could be wrong about what he was thinking, that he was thinking was undeniable.

If a tree falls in the forest and no one is there to hear it, does it make a sound?

-Bishop George Berkeley

An idealist, Berkeley thought nothing is real but minds and their ideas. Ideas do not exist independently of minds. He concluded that "to be is to be perceived." Something exists only if someone has an idea of it.

We live in the best of all possible worlds. -Gottfried Wilhelm Leibniz

The optimist - before creation God contemplated every possible way the universe could be and chose to create the one in which we live because it's the best.

The age of the Renaissance included rationalism, the reliance on reason alone, as first espoused by Rousseau. Idealism was associated with Immanuel Kant - the world only exists subjectively, in the mind. So for each mind, a different world.

Modern

Modern types of philosophy seen in science today include:

Scientism - the world can be completely explained by science.

Materialism - only matter exists; there is no other immaterial world.

Naturalism - only nature exist; denies a spiritual world.

Scientific modernism - a blend of materialism and humanism

Humanism - one quote captures the humanistic view *man is the measure of all things.*

Agnosticism - believes there is truth, but no human way to find it.

Nihilism - there is no truth, and no sense in trying to find it.

Atheism - there are three types of atheist.

Theoretical: believes there is no God, but lives as though there were.

Practical: believes there is a God, but lives as though there were not.

True: believes there is no God, and lives as though there were not.

4. Logic

The branch which studies the set of rules for truth discovery and by which one can formulate convincing arguments. It is "the science of argument." When presenting an argument, one takes a set of premises that are proven to be true, and uses logic to show how they prove a certain conclusion. An important question in logic is what content is provable in a system that uses axioms.

Gödel's theorem

...proves that all logical axiomatic systems begin with unproven premises that are not provable within the logical system. For example, a dictionary requires that to look up a word, you already have to know a minimum set of words... those words could be called the dictionary's metaphysics, the words assumed to be true and accepted.

This theorem means that all human knowledge domains are subject to incomplete sources of knowledge... except theology, which accepts beliefs based on knowledge revealed from outside the human system. This does not violate Gödel's theorem, since the axioms/beliefs are not part of the KD. Thus, the only complete logical system is theology.

We retain the classical scientific method of Bacon – form hypothesis; find experimental evidence; validate predictions.

The key concepts are testability and logical consistency required throughout.

5. Philosophical quotes¹

A common view of philosophy is as simply a set of aphorisms which may be inspirational, humorous or just confusing. But philosophy is much more than a gathering of stand-up comedians giving out one-liners.

Here are a few sample quotes on philosophy:

Philosophy of science is about as useful to scientists as ornithology is to birds.

-Richard Feynman

This is the mainstream majority opinion of philosophy... Usually this response is due to ignorance of realism...or just generic ignorance. In any case, it's too late to ask Feynman the basis for his statement.

Scientists are explorers. Philosophers are tourists.

-Richard Feynman

Rather, realist philosophers are the architects and builders of the knowledge foundation; scientists complete the upper floors.

Philosophy is like trying to open a safe with a combination lock: each little adjustment of the dials seems to achieve nothing, only when everything is in place does the door open.

-Ludwig Wittgenstein

So an incomplete understanding of philosophy accomplishes nothing.

Rightly defined philosophy is simply the love of wisdom.

-Marcus Tullius Cicero

From its Greek roots – love of wisdom

To teach how to live without certainty and yet without being paralyzed by hesitation is perhaps the chief thing that philosophy, in our age, can do for those who study it.

-Bertrand Russell

A code for survival....

Making itself intelligible is suicide for philosophy.

-Martin Heidegger

The pessimistic or gnostic philosopher

Science gives us knowledge, but only philosophy can give us wisdom. - Will Durant

Yes – facts vs. integration of facts into a coherent worldview that determines lifestyle.

Philosophy: unintelligible answers to insoluble problems. -Henry Adams

Another pessimist/agnostic

The society which scorns excellence in plumbing as a humble activity and tolerates shoddiness in philosophy because it is an exalted activity will have neither good plumbing nor good philosophy: neither its pipes nor its theories will hold water. -John W. Gardner

Philosophy, like medicine, has plenty of drugs, few good remedies, and hardly any specific cures. -Nicolas Chamfort

One of several self-critical quotes

Philosophy is the product of wonder. -Alfred North Whitehead

A true believer...

You can't do without philosophy, since everything has its hidden meaning which we must know. -Maxim Gorky

But if everything has a hidden meaning, how can we know anything! This is a self-conflicting statement – paradoxes are often the subject of philosophy.

The true function of philosophy is to educate us in the principles of reasoning and not to put an end to further reasoning by the introduction of fixed conclusions. -George Henry Lewes

There's a moral for MS physics here.

When you're in the muck you can only see muck. If you somehow manage to float above it, you still see the muck but you see it from a different perspective. And you see other things too. That's the consolation of philosophy. -David Cronenberg

Realism gives a different – and correct – perspective.

You should carefully study the Art of Reasoning, as it is what most people are very deficient in, and I know few things more disagreeable than to argue, or even converse with a man who has no idea of inductive and deductive philosophy. -William John Wills

Exactly my thoughts when reading some free-wheeling forum discussion.

6. Science quotes²

The proper subject of this paper is philosophy applied to science. Many modern scientists have assumed that philosophy is naught but a collection of memorable epigrams from non-scientists...scientific poetry, as it were. The various diverse schools of philosophy collectively known as modernism admittedly make this assumption credible...but only if realism is not clearly defined and separated from the intellectual chaos that modernism represents.

Here are the thoughts of some philosophers about science.

Science is simply common sense at its best that is, rigidly accurate in observation, and merciless to fallacy in logic. -Thomas Henry Huxley

Unfortunately for Darwin's bulldog, this aphorism is more observed by MS physics in the breach than in its observation.

Science is facts; just as houses are made of stone, so is science made of facts; but a pile of stones is not a house, and a collection of facts is not necessarily science. -Jules Henri Poincaré

...thus undermining most of modern education

It requires a very unusual mind to undertake the analysis of the obvious.

-Alfred North Whitehead

Philo-analysis of modern physics with realism will expose the painfully obvious.

[Science is] a series of judgments, revised without ceasing. Yet the current science is pursued as if infallible – history notwithstanding.

-Oliver Wendell Holmes

Got to be one of my favorite quotes...the penalty for ignoring (scientific) history is to repeat its mistakes.

In essence, science is a perpetual search for an intelligent and integrated comprehension of the world we live in.

-Cornelius Bernardus Van Neil

That is philosophy, not science, Connie.

Science can only ascertain what is, but not what should be, and outside of its domain value judgments of all kinds remain necessary.

-Albert Einstein

...exposing the weakness of science as a KD. A recognition of the proper but inferior role of science... from a surprising source.

As far as the propositions of mathematics refer to reality they are not certain, and so far as they are certain, they do not refer to reality.

-Albert Einstein

Have the modern disciples of Einstein read this?

The most incomprehensible thing about our universe is that it can be comprehended.....

A little knowledge is a dangerous thing. So is a lot.....

-Albert Einstein

Applies well to modern relativists.

Newton, forgive me.

-Albert Einstein

A statement of respect, or an admission of guilt/error?

Now, my own suspicion is that the universe is not only queerer than we suppose, but queerer than we can suppose. I suspect that there are more things in heaven and earth that are dreamed of, or can be dreamed of, in any philosophy. That is the reason why I have no philosophy myself, and must be my excuse for dreaming.

-John Burden Sanderson Haldane

Supports agnosticism...ironical that his 'dreams' have become today's establishment beliefs and the nightmares of realist philosophers.

Shall I refuse my dinner because I do not fully understand the process of digestion?

-Oliver Heaviside

So Rome wasn't built in a day. Why test if we know the result?

The mind likes a strange idea as little as the body likes a strange protein and resists it with similar energy. ... a new idea is the most quickly acting antigen known to science. If we watch ourselves honestly we shall often find that we have begun to argue against a new idea even before it has been completely stated.

-Claude Bernard

...like realism, absolutism or geocentrism, Claude?

We see only what we know.

-Percy Williams Bridgman

The antidote for resistance to change – paradigm shifting.

[Those] who have an excessive faith in their theories or in their ideas are not only poorly disposed to make discoveries, but they also make very poor observations.

-Max Born

Faith means belief without seeing -the wrong choice of word here.

... the scientist would maintain that knowledge in of itself is wholly good, and that there should be and are methods of dealing with misuses of knowledge by the ruffian or the bully other than by suppressing the knowledge.
-Percy Williams Bridgman

Is mainstream physics a ruffian/bully? Is peer review a means to access – or suppress - new knowledge?

7. Metaphysical Assumptions/Axioms

Metaphysical Assumptions or Axioms

The set of self-evident premises or assumptions or axioms form the initial base for building a KD... the metaphysics that precedes the physics. Self-evident premise here means a concept that can't be proven inductively, but can't be imagined to be wrong. like $2+2 = 4$.

Self-referential contradictions were the subject of study by Bertrand Russell and logicians. They should be removed from any metaphysics set of axioms. An example is:

Only one thing is certain--that is, nothing is certain.

If this statement is true, it is also false, conflicting in truth value with itself.

Strangely enough, these one-line contradictions are common in science dialogues and essays. For example, here's a statement that attempts to show there is no truth, a form of relativism often used by atheists and nihilists.

There is no absolute truth!

Whether this be true or false, it is self-contradictory. Of course, if a philosophy accepts contradictions (contrary to realism) then self-referential ones will be accepted. Otherwise, we can logically correctly say:

There is at least one absolute truth.

Metaphysical Realism

To prevent the collapse of logic we insist that there be a metaphysics of realism. These should be discussed until common ground is found. Here are a few tenets of realism:

1. Principle of Non-contradiction: *It is impossible that the same thing be and not be at the same time and in the same respect.*

Corollary There is nothing between existence and non-existence, being and non-being.

2. Causality: *Every effect has at least one cause.*

Actions/events must be connected by cause and effect, which we derive from experience.

Establishment physics would point out that we don't know the causes of many effects/events, but that speaks to our current ignorance, not to the absence of causality.

Corollaries to this axiom:

- *Action at some distance with no intermediate causes is totally repugnant.*
 - *Whatever changes is changed by another.*
 - *The cause is greater than the effect.*
 - *Without the cause there can be no effect.*
3. Ontological properties of being: *All beings have both existence and essence.*
- *Existence: that which is.*
 - *Essence : that within being that makes it what it is.*
4. Behavior follows nature/being. *Actions come from the essence of being.*
Every being conforms to its own nature, so actions are clues to the nature or essence of being.
5. Sense knowledge: *There is nothing in the mind that did not enter through the senses.*
A rejection of idealism. The world as known via the senses is the source of knowledge.
6. Source of knowledge: *Everything in the mind has a foundation in reality.*

Note that the statement is not that all in the mind exists in reality.

7. Reliability of senses: *The functional sense faculties are reliable, relative to their proper object.*
The eye cannot hear, the ear cannot taste.
Functional means in normal order.
8. Universals: *The intellect handles universals ; the senses particulars.*
The mind deals with abstract symbols; the senses with concrete images/impressions.
9. Knowing reality: *What is knowable has existence.*
To be known to the mind, concepts must originate in reality and passed through the senses.
10. Self-causality: *Nothing causes itself.*
A corollary of the principle of sufficient reason: nothing can give what it does not already have.
This rejects an uncaused origin of the Big Bang expansion.
11. Reality and existence : *Nothing can act if not in existence.*
A rejection of conventional quantum mechanics....
12. Consistency of causes: *In the same circumstances the same causes produce the same effects.*
There is no truly random process, contrary to quantum mechanics.
13. Crux of the scientific method : *Theory guides but experiment decides.*

8. Much ado about nothing

We can put our realism philosophy to work, based on the metaphysics just proposed. Two concepts often bouncing around the physics world are nothing and infinity. Neither of these has existence.... Let's use realistic principles to see why.

Nothing or nihil - the absence of anything; non-being - must be distinguished from physical vacuum, space that is empty of matter. The vacuum of deep space must contain at least the CMB radiation, and probably a few sparse hydrogen atoms. And if EM radiation exists everywhere, then so must its medium... aether. But that's digressing.

So the philosophical concept of *nihil* has no properties capable of description, so physics - under the scientific method rule of testability, has no way to verify the existence or essence of 'nothing'. As Aristotle said, "from nothing comes nothing". With no cause, there's no effect... the principle of causality.

Another slant on this concept is the need for knowledge to enter the mind via the senses - a realism principle. With *nihil*, there's nothing - literally - to trigger the senses.

In using the word nothing, then, we have no mental image of what we mean... except as a negation of what we can perceive! If you think that's obvious, then think again.

A pop culture physicist named Lawrence Krauss ventured into philosophical turf with his new book - *A Universe from Nothing: Why There Is Something Rather than Nothing* by Lawrence M. Krauss³

This limited philosophical view by a physicist would be the subject of formal analysis by a trained philosopher in *Not Understanding Nothing*

- A review of *A Universe from Nothing* by Edward Feser⁴

The review is excellent and displays how a mainstream physicist struggles when the basic foundations of knowledge are missing.... or dismissed with hubris; portions of the review follow.

Krauss' aim is to answer the question "Why is there something rather than nothing?" without resorting to God - and also without bothering to study what previous thinkers of genius have said.

.... Krauss doesn't understand the question itself. There is a lot of farcical chin-pulling in the book over various "possible candidates for nothingness" and "what 'nothing' might actually comprise, along with an earnest insistence that any "definition" of nothingness must ultimately be "based on empirical evidence" and that 'nothing' is every bit as physical as 'something' - as if "nothingness" were a highly unusual kind of stuff that is more difficult to observe or measure than other things are.

“Nothing” is not any kind of thing in the first place but merely the absence of anything. To ask why there is something rather than nothing is just to ask why it isn’t the case that all of these statements [about what exists] are false. There is nothing terribly mysterious about the question, however controversial the traditional answer.

The bulk of the book is devoted to exploring how the energy present in otherwise empty space, together with the laws of physics, might have given rise to the universe as it exists today. This is at first treated as if it were highly relevant to the question of how the universe might have come from nothing – until Krauss acknowledges toward the end of the book that energy, space, and the laws of physics don’t really count as “nothing” after all. Then it is proposed that the laws of physics alone might do the trick – though these too, as he implicitly allows, don’t really count as “nothing” either.

His final proposal is that “there may be no fundamental theory at all” but just layer upon layer of laws of physics, which we can probe until we get bored. But this is no explanation of the universe at all. In particular, it is nowhere close to what Krauss promised his reader – an explanation of how the universe arose from nothing – since an endless series of “layers” of laws of physics is hardly “nothing.” His book is like a pamphlet titled ‘How to Make a Million Dollars in One Week’ that turns out to be a counterfeiter’s manual.

Krauss is notable not only for sophomoric philosophical errors but also for sheer repetitiveness. Why do trained physicists wander so far from coherence? One possibility ... a picture holds these thinkers captive, a picture of the quantitative methods of modern science that have made possible breathtaking predictive and technological successes.

The thinker who claims to eschew philosophy in favor of science is constantly tempted “to make a metaphysics out of his method,” trying to define reality as what his preferred techniques can measure rather than letting reality dictate what techniques are appropriate for studying it. He is like the drunk who thinks his car keys must be under the lamppost because that is the only place there is light to look for them – and who refuses to listen to those who have already found them elsewhere.

Krauss approvingly cites physicist Frank Wilczek’s unflattering comparison of string theory to a rigged game of darts: “First, one throws the dart against a blank wall, and then one goes to the wall and draws a bull’s-eye around where the dart landed.” Yet that is exactly Krauss’ procedure. He defines “nothing” and other key concepts precisely so as to guarantee that only the physicist’s methods he is comfortable with can be applied to the question of the universe’s origin – and that only a non-theological answer will be forthcoming.

Krauss’ voyage does not take his reader where he thought he was going. To the centuries-old debate over why any universe exists at all, Krauss’ book contributes – precisely nothing.

Typically, establishment physicists are out of their league in dealing with topics from other domains, especially philosophy. Reality that conflicts with their limited physics worldview must be interpreted to be in agreement, either forcefully or illogically.

7 More than enough – the infinite

Infinity is another word that is bandied about, but has no generally accepted interpretation in physics. The mess all starts with the cavalier attitude towards the meaning of infinite, which leads up to mainstream confusion over whether space and time are infinite or if time ever began? In most cases physicists don’t try to reason the meaning of infinite from first principles (metaphysics), but just assume the universe is either finite or infinite and use their assumption to support their pet theory.

Infinite does have a well-defined meaning in philosophy, so it’s reasonable that the existential question of real infinities in space or time has already been known to philosophers for two and a half millennia, since the age of Pericles. The simple answer is that there are no infinities in reality....

Infinity is: *something without any limit, edge or end; unboundness.*

Many scientists – who should know better – make the mistake of implying that an infinite number is bigger than any other number. But infinity in mathematics is not number or quantity at all; in fact, it's the absence of definite quantity!

There's agreement that infinities exist in mathematics. The set of natural numbers is infinite ...and also immaterial. (We shall see that being immaterial is a property of infinity.) The set of numbers is also unchangeable (no new number can be added). So being unchangeable/immovable/immutable is also a property of infinity.

Mental operations of the mind (not the brain!) use infinite objects...numbers ...and symbols...and images. So the mind is infinite in the sense of unlimited ideas or thoughts, but limited (by the physical brain) to having only one idea in focus at a time.

But does realism offer evidence that time and space (the universe of things) is finite?

Consider time.... An interval of time is not infinite because it will be replaced by another time interval, which means its change indicates it has not reached its limit – so any interval of time is finite. If time did reach a point where it did not change, then infinity would be a possibility... but when time stops, it disappears... it no longer exists!
So time is not infinite... Welcome to Realism 101!

An argument can also be presented, that time had a beginning, using proof by contradiction:

- 1- There are only two possibilities : the hypothesis is true and its contradiction is false or the hypothesis is false and its contradiction is true
- 2- Assume the contradiction of the hypothesis is true
- 3- Show that assumption leads to a contradiction
- 4- If the contradiction is false, then the hypothesis must be true

Either time had a beginning (finite past) or did not have a beginning (infinite past). There are no other possibilities.

Assume time did not have a beginning (infinite past). Then the current time now, t_0 , must be preceded by an infinite set of time intervals. But then time t_0 now can never be reached. But we clearly have reached the present time....

Infinite past has no limit, so the span of time before any particular time can never be completed! Since infinite past is a false concept, past time must be finite – time had a beginning. The error in logic is assuming that an infinite sequence of time intervals could ever, in reality, reach a particular time.

Material objects are limited by their essence or nature. They can change in their accidental features, but not in their essential properties. No matter how many material objects we gather, the number always remains finite (countable). The question is if all the objects in the universe are countable. The answer is no. Of importance, of course, is why.

What about an infinite universe, meaning a universe containing an infinite number of objects?

The history of this issue goes back to Plato, who held that the infinity of the counting numbers – which are abstractions of quantities observed in reality – was also true for reality...an actual set of infinite objects /beings existed. Among the modern Platonists are included all those physicists who believe in an infinite universe ...erroneously.

Can the universe of all objects be shown to be infinite like the number systems are?

First we assume the set of all objects is infinite...without limit.

The set of all real objects is disordered, but can be put in order by labeling each object in the universe with the next counting number, step by step, starting from zero, until every object is numbered. This will not affect whether the set is finite or infinite, but allows the objects to be identified.

If the universe's set was finite, then we would always be able to count back to the start at zero. Since the premise is that the set is infinite, there must be at least one numbered object which takes more than a finite number of steps to count back to zero (Else the premise of an infinite set of objects would be false).

But a number which is greater than any finite number is a contradiction – it's not a number at all.

The infinite universe premise is logically inconsistent; the universe of objects is finite.

This conflict will occur whenever a correspondence is attempted between the unlimited mental world of math symbols and the real world of concrete existing objects. *Ref:vi*

In philo-realism the source of knowledge is the testimony of the senses. Yet neither infinity nor nothing can be perceived by the senses; the two are in fact the absence of any sense impression, the lack of direct experience required not only by realism but by the scientific method. Without the foundation of realism scientists will not be able to rationally resolve their confusion over the nature of infinity and nothing.

The infinite was defined by Aristotle as: *whatever quantity is taken, there is always something more to take; that which can't be traversed.*

The infinite in reality was distinguished from that in potency...that is, the potentially infinite, as is found in the mental abstraction of mathematics. According to Ari's definition the natural numbers have this potential; they can always be extended, but never completed. But the natural numbers do not exist, as natural numbers, in reality.

Ari denied an actual infinite could exist in the real world, because changes or motion could not occur. One of his arguments involved using the geocentric model of his times to analyze the orbital arc length of a celestial object an infinite distance from Earth. During its motion the object must travel an infinite arc distance, because the radii are both infinite; an impossibility, since an infinite interval cannot be traversed.

This argument is dependent on the geocentricity premise, a belief held by almost all the ancient Greeks. So the validity of the argument will be held in abeyance until the validity of the geocentric axiom is established in later analysis.

Aquinas refines motion

Aquinas later refined the concept of motion and change by examining the process of cause and effect and finding motion to be a change from an actual state of being now to a new potential state of being, where the set of potential states are the limits of the change.

For example, a wheel (actual) can roll to a new location (potency) but cannot change into a tree (impotency). A change in finite beings then implies limits to its potential new states of being. As an infinite being has no limits a change in a infinite being would be impossible, as it would be a choice between limits which it does not have.

A very powerful conclusion, then: Finite beings change; infinite beings are immutable.

Applied to observations of the universe of reality, we see all things are subject to change.

Therefore, reality is finite.

The key is comprehending that being infinite implies being immutable. (This does not preclude, however, what is not physically observable being immutable...and infinite). *Ref:vii*

Space, mass and time – the trinity of measurement – are all finite, in the school of realism.

Whatever is infinite has no need to – or possibility of – changing from one state to another second state, because changing means a limit is being approached but not yet achieved. Whatever is infinite has no limits, by definition.

This simple beginning of realist thinking, if accepted, can provide common metaphysical ground for research and debate, and sharpen what is often sloppy physical reasoning.

The fault with modern physicists basically lies in a belief in their knowledge domain that is severely handicapped in its scope of truth sources (epistemology) and their closed minds to more general systems for discovering truth. See how the great leaders of physics stumble and fall over issues like non-existence and infinity while the philosophers of realism dispose of them with resort only to common experience, clear definition of beliefs (metaphysics) and clear rational thought (logic).

8. Scientism revealed

The antithesis of realism, philosophically, is probably a form of modernism called scientism. Philosopher Feser does more excellent work in applying philosophical rules to this modern blight on scientific thinking.

Some of his two-part series^{viii} is presented below:

[] contains my comments.

Scientism is the view that ALL real knowledge is scientific knowledge – that there is no rational, objective form of inquiry that is not a branch of science. Indeed, the culture at large seems beholden to an inchoate scientism – “faith” is often pitted against “science” (even by those friendly to the former) as if “science” were synonymous with “reason.”

Scientific inquiry itself rests on a number of philosophical assumptions [collectively termed Realism]:

- *that there is an objective world external to the minds of scientists;*
- *that this world is governed by causal regularities;*
- *that the senses are capable of faithfully representing the world to the mind*
- *that the human intellect can uncover and accurately describe these regularities*

Since [pre-modern?] science presupposes these things, it cannot attempt to justify them without arguing in a circle. And if it cannot even establish that it is a reliable form of inquiry, it can hardly establish that it is the only reliable form. Both tasks would require “getting outside” science altogether and discovering from that extra-scientific vantage point that science conveys an accurate picture of reality – and in the case of scientism, that only science does so.

There is also the question of how to interpret what science tells us about the world. For example, is the world fundamentally comprised of substances or events? What is it to be a “cause”? Is there only one kind? (Aristotle held that there are at least four.) What is the nature of the universals referred to in scientific laws – concepts like quark, electron, atom, and so on – and indeed in language in general? Do they really exist over and above the particular things that instantiate them? Scientific findings can shed light on such metaphysical questions, but can never fully answer them. Yet if science must depend upon philosophy both to justify its presuppositions and to interpret its results, the falsity of scientism seems doubly assured.

Its advocates may now insist:all rational inquiry is scientific inquiry. The trouble now is that scientism becomes completely trivial, arbitrarily redefining “science” so that it includes anything that could be put forward as evidence against it. Worse, it makes scientism consistent with views that are supposed to be incompatible with it. . . For the whole point of scientism...was supposed to be to provide a weapon by which fields of inquiry like theology might be dismissed as inherently unscientific and irrational.

.... the “objectivism” inherent in scientism.... could be realized only by focusing on those aspects of the natural world susceptible of strict prediction and control, and this in turn required a quantitative methodology, so that mathematics would come to be regarded as the language in which the “book of nature”

was written. And yet our ordinary, everyday experience of the world is qualitative through and through – we perceive colors, sounds, warmth and coolness, purposes and meanings.

.... the commonsense, qualitative “manifest image” came to be regarded as a world of mere “appearance,” with the new quantitative “scientific image” alone conveying “reality.” The former would be re-defined as “subjective” – color, sound, heat, cold, meaning, purpose, and the like, as common sense understands them, exist in the mind alone[idealism]., if color, temperature, sound and the like are to be regarded as existing in objective reality, they must be redefined – heat and cold reconceived in terms of molecular motion, color in terms of the reflecting of photons at certain wavelengths, sound in terms of compression waves, and so forth. The new method thus ensured that the natural world as studied by science would be quantifiable, predictable, and controllable – precisely by redefining “science” so that nothing that did not fit the method would be allowed to count as “physical,” “material,” or “natural.” the mind ...cannot even in theory be assimilated via quantitative modeling to the material world, as that world has been characterized by physical science. The very nature of scientific understanding, at least as the moderns have defined it, thus entails a “practical dualism” of mind and matter....

Human thought and action, including the thoughts and actions of scientists, are of their nature irreducible to the meaningless, purposeless motions of particles and the like. Some thinkers committed to scientism realize this, but conclude that the lesson to draw is not that scientism is mistaken, but that human thought and action are themselves fictions.

[again, idealism] What is true of human beings is only what can be put in the technical jargon of physics, chemistry, neuroscience and the like.

So scientism consistently pursued leads to the ... position that the human mind itself is a fiction – that there are no such things as thinking, perceiving, willing, desiring, and so forth. This position is not only incoherent, but undermines the very possibility of science itself – the very thing scientism claims to champion.

Why would anyone be attracted to such a bizarre and muddleheaded view? Hypnotized by the unparalleled predictive and technological successes of modern science, contemporary intellectuals infer that scientism must be true, so that anything that follows from it – however fantastic or seemingly incoherent – must be true as well. But this is sheer sophistry. If a certain method of studying nature affords us a high degree of predictive and technological power, all that shows is that the method is useful for dealing with those aspects of nature that are predictable and controllable. It does not show us that those aspects exhaust nature, that there is nothing more to the natural world than what the method reveals. Neither does it show that there are no rational means of investigating reality other than those involving empirical prediction and control. To assume otherwise is fallaciously to let one’s method dictate what counts as reality rather than letting reality determine what methods are appropriate for studying it.

[Plato’s troglodytes only knew a world of cave shadows; they knew nothing of the 3-D world of color outside the cave. Mainstream scientists in the throes of scientism are like the cave-dwellers – ignorant, of course, of what they don’t know. Unlike the Plato model, the scientists of today have access to a full epistemology of truth, but choose to ignore it for ideological reasons.]

A passage from Bertrand Russell brings the point further.....:

It is not always realized how exceedingly abstract is the information that theoretical physics has to give. It lays down certain fundamental equations which enable it to deal with the logical structure of events, while leaving it completely unknown what is the intrinsic character of the events that have the structure. We only know the intrinsic character of events when they happen to us. Nothing whatever in theoretical physics enables us to say anything about the intrinsic character of events elsewhere. They may be just like the events that happen to us, or they may be totally different in strictly unimaginable ways. All that physics gives us is certain equations giving abstract properties of their changes. But as to what it is that changes, and what it changes from and to – as to this, physics is silent.

...The knowledge physics gives us is so exceedingly abstract....that it leaves it completely unknown what the inner nature of those objects, apart from their mathematically definable properties, really is. And yet the physical world is not a mere abstraction..... If we are to know what that inner nature is, and to know of anything else about which empirical science is silent, we must go beyond science – to philosophy, the

true "paradigm of rationality," But ...don't philosophers notoriously disagree among themselves? Even if it is conceded that there is more to the world than science tells us, mightn't we nevertheless be justified in ... concluding that ... scientism is a reasonable attitude to take in practice, even if problematic in theory? The trouble is that this is itself a philosophical claim, subject to philosophical criticism and requiring philosophical argumentation in its defense. The very attempt to avoid philosophy implicates one in practicing it. !!

Even the attempt to escape metaphysics is no sooner put in the form of a proposition than it is seen to involve highly significant metaphysical postulates.

If you cannot avoid metaphysics, what kind of metaphysics are you likely to create while attempting to deny it or ignore it? It will be passed on to othersby insinuation rather than by direct argument...

[This is the rhetoric of mainstream physics.]

The thinker who decries metaphysics must still have a method to communicate, and he will be under a strong and constant temptation to make a metaphysics out of his method; that is, to suppose the universe ultimately of such a sort that his method must be appropriate and successful.

[The structure of the universal laws is prejudged and predefined to satisfy the theory proposed.]

We have no choice but to engage in philosophy. The only question is whether we will do it well or badly.

Those committed to scientism pretend not to do it at all, but what they have really done is made a metaphysics out of their method, a very bad metaphysics indeed. Only those who do not eschew philosophy....are going to do it well....

Denying the reality of these things seems to lead to nihilism and even incoherence. Beholden as intellectuals in general are to the scientific spirit of the age, too few think to question the assumptions that led to the impasse in the first place.

[A consensus of scientific metaphysics is non-existent].

Disagreement that plagues contemporary philosophy is largely a consequence of scientism, or at least of a methodological bias that scientism has raised to the level of an ideology.

What happens when we do reject this bias....is a return to the philosophical wisdom of the ancients and medievals... their metaphysics has never been surpassed. There is a common core to the tradition they founded....that sets them apart from the decadent philosophical systems of the moderns.

This core constitutes a "perennial philosophy" apart from which the harmony of common sense and science, and indeed even the coherence of science itself, cannot be understood. Only those who know something about philosophy and its history, and who have grappled seriously with its questions, have earned the right to pronounce on the rational credentials of science....that most definitely does not include those blinded by scientism.

Among the questions materialism/scientism can't answer are:

Why there is something - not nothing?

How does materialism explain the mind-brain interface?

... the mind's independence of space and time?

...the phenomenon of consciousness?

... the material difference between a living body and a corpse?

9 Conclusion

The primary basis for common ground in science is not the scientific method nor language, but a consensus on a philosophical worldview.

Can a building be constructed without a foundation? Even if the workers speak the same language..... what if the builders don't agree on what tools to use, or how to use them?

What if there are no building codes for guidance, or workers just ignore the codes?

What if there are no inspectors to enforce the codes?

Just as this hypothetical structure is doomed to collapse, any scientific Knowledge Domain – like physics - is doomed to fail without a common ground of tools and rules as a foundation to build upon.

The commonality for building natural knowledge domains that's missing is a realistic worldview - philosophical realism. The world of mainstream modern physics either ignores or denies the role of philosophy, metaphysics and logic in building a physics KD. Like the unskilled and clueless construction workers, the edifice of knowledge they build will be as a house of cards.....destroyed by a mere zephyr of the truth.

Realism has long been on the scene. Founded by Aristotle and refined by Middle Age scholastics, realism was then replaced by brands of modernism – materialism, scientism, humanism, naturalism, idealism, agnosticism and even nihilism. Evidence of realism's rejection is found in Copernicanism, Darwinism, Relativity, Quantum Mechanics and Big Bang Cosmology.

Realism is offered here as this key basis for communication. Its metaphysical premises are summarized below, albeit incompletely.

Metaphysics of Realism

1. An objective world exists - external to and independent of - the minds of scientists.
2. The senses are capable of faithfully representing the world to the mind.
3. The human intellect can discover and adequately describe these regularities.
4. Non-contradiction: It is impossible that the same thing be and not be at the same time and in the same respect.
5. Causality: Every effect has at least one cause.
6. Sufficient Reason: Nothing can give what it doesn't already have.
7. All beings have both existence and essence.
8. Behavior arises from the nature of being.
9. Knowledge source: There is nothing in the mind that did not enter through the senses.
10. Reliability of knowledge: Everything in the mind has a foundation in reality.
11. Reliability of the senses: The functional sense faculties are reliable when presented with their proper object.
12. Universals: The intellect uses symbolic universals; the senses use concrete particulars.
13. Self-causality: Nothing can cause itself.
14. Reality and existence: Nothing can act if not in existence.
15. Consistency of causes: In the same circumstances the same causes produce the same effects.
16. Link to the scientific method: Theory guides but experiment decides.

Realism applied to modern science

Quantum Mechanics: Some versions – like the Copenhagen theory - hold that reality/events are caused by human observation. This is denied by realism axiom 6: Sufficient reason for a cause.

Cosmology: Big Bang theory entertains the notion that the universe came to existence from nothing. A violation of axiom 5, a lack of causality.

Darwinism: Evolution proposes that beings can change into higher orders of being by interacting with their environment. But the evolved properties are not present in the environment.... A violation of axiom 6: Not sufficient reason for a cause.

Relativity: - a topic of such complexity and confusion as to require coverage in a separate analysis.

Consider using these tools in your own scientific research.

Or else join with modern scientists drifting in a sea of intellectual ignorance, bereft of guiding stars or navigating tools.

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