Fundamentalism as a metaphysical concept

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Introduction

The difference between humans and animals is that we search for 'causes'. For every event, a cause is expected, and nearly always there is an explainable cause, which in turn can be explained by some other causes. This cause-effect relation thus carries us backwards to some primary-causes, which are either arbitrary or self-explanatory. These primary-causes are what we call 'fundamentals'.

If there were no causal factors and everything happened arbitrarily, then there would be nothing to be known, nothing to be explained. Thus our pursuit of knowledge depends entirely on cause-effect relation. Cause-effect relation takes us to the primary-causes, implying the existence of 'fundamentals' in all areas of knowledge.

Metaphysics is a branch of philosophy dealing with the essence or reality of things in nature; so it is essentially a search for the primary-causes (fundamentals) behind these things. Thus the term 'fundamental' has a metaphysical connotation.

Concept of fundamentalism

Fundamentalism can be regarded as a method or a philosophical approach to arrive at the truth behind the things we observe. Though the concept has been in existence for a long time in different forms, its significance has not been properly studied. Here I try to formalize a concept of fundamentalism. The concept can be defined as follows: “Any field of knowledge has some fundamentals, based on which everything in that field can be logically explained, and so by identifying the fundamentals, we can arrive at the truth”. This implies that theoretical model-building based on fundamentals can lead us to the truth.

If there is only one fundamental entity and it has only one property, then the number of fundamentals is just one. With just one fundamental, there will be nothing to be explained. So the number of fundamentals in any field of knowledge has to be more than one. It should be either one fundamental entity having more than one property or more than one fundamental entities having different properties.

Once the fundamentals are properly identified, we have to know how these interact; that is, what laws these follow. Based on these, we have to explain the emergent structures and emergent causal factors until everything in that field is explained. There can be only one model that can explain everything, and it represents the truth. If everything is explained, we can say that we gained complete knowledge in that field.

The major drawbacks of fundamentalism are that (i). the fundamentals are not always properly identified (ii). logical errors creep into the explanation. Both 'over-familiarity' and 'lack of knowledge' contribute towards those errors, and often the errors get ignored or go unnoticed. Religious fundamentalism is a classic example of how the search for truth based on fundamentalism gets derailed due to errors.

Implications of fundamentalism on other concepts

Nature:
Everything that exist and everything that we observe come under the definition of nature. Nature as a field of knowledge thus encompasses all other fields of knowledge. The primary-causes (fundamentals) of nature constitute the basic fundamentals of all fields. However, the choice of fundamentals is arbitrary; the only criterion is that it should be possible to explain everything in that field based on that fundamentals. So the primary-causes in a given field of knowledge need not always extend to the most basic fundamentals of nature.

Causality and emergence:
Since causality lies behind all our knowledge, and it is causality that leads to the primary causes, fundamentalism implies that in any field of knowledge, no event will be happening without a cause; or nothing happens arbitrarily. The fundamental entities are the primary players; if these are to interact creating emergent structures, there should be a top-down control to confine these. Once an emergent structure becomes stable, it may not revert back to fundamental entities; it exerts a top-down control on its constituents. Further emergence depends on such structures. Fundamentalism implies that bottom-up and top-down causal factors are required for emergence, and at least one primary-cause will be top-down.

Finite/ infinite:
Fundamentalism and infinity do not go together. An infinite number of fundamentals in any domain of knowledge imply that nothing is fundamental or all are fundamental; that is, everything is arbitrary, and there is nothing to be explained. Similarly, if any of the fundamentals has infinite causal power, the rest will have no effect, and that leaves nothing to be explained based on causal factors. So the number of fundamentals and their causal powers have to be finite.

We can never add up finite things to create infinite things; the number can become very very large, but will always be finite. To create infinite things, we have to introduce an infinite-loop condition, 'add on things infinitely'. That means, only infinity can create infinity, and finite things can never add up to infinity. The concept of fundamentalism implies that any field of knowledge is finite in extent because the number of fundamentals in any field is finite. Fundamentalism thus excludes infinity from all our theoretical models.

Quantum/continuous:
Since the number of fundamentals is finite and each fundamental has only finite causal powers, the fundamentals are 'quantized'. None of the fundamentals can be continuous. A quantized entity is always quantized, and there can be no transition between quantum and continuous states. Creating structures that appear to be continuous using quantized entities will lead to imperfections. So emergent structures are imperfect, and the one with the least imperfection will be the most symmetric and the most stable.

Space and time:
Our knowledge comes primarily from things that exist in space and time. So space and time are unavoidable concepts in any field of knowledge. Both are infinite and continuous. However, this infinite and continuous space/time has no relevance in any field; these just remain as the arena or frame in which the fundamentals exist. It is the quantized (that is, arbitrarily cut chunks of) 'time and space', associated with the fundamental entities, that take

part in interactions. So none of the interactions extends to infinity either in space or time. All processes involving fundamental entities are confined to finite space and finite time.

So, if the fundamental entities have a beginning, they will just pop out in space, remain confined in a finite region of space and will just disappear within a finite time. If they do not have a beginning, they will remain in an infinite-loop in both space and time. A single loop constitutes a series of finite processes that brings them back to the initial state. As the direction of space can reverse, the loop is confined within a given finite space; as time direction is irreversible, the loop moves forward in time.

Laws and properties:

Any field of knowledge has some fundamental entities, and each entity has certain properties. Given these properties, the entities interact, and the laws decide how these entities change with time. When new structures emerge, their properties may be different, and the laws governing the interactions may also be different. At present, there exists some ambiguity in differentiating between laws and properties; some properties are regarded as laws, and some laws are regarded as properties. The concept of fundamentalism requires a clear distinction between laws and properties.

Consider the statements, 'every body attracts every other body' and 'force of attraction is directly proportional to the product of the masses'. The former gives the property of bodies, while the latter is a law regarding how this property works. The difference is that the former is just a statement, but the latter is a mathematical statement, an equation. We can generalize this and say that a law is always a mathematical statement. The basic law of mathematics is the law of addition. The rest of the laws in mathematics are emergent (depending on the given environment), and these are true, if and only if, the law of addition is correct.

The game of chess provides a suitable example to differentiate between laws and properties. Different pieces move in a different ways. These are referred as laws or rules of the game. But actually these are arbitrary properties assigned to each. The progress of the game, however, depends on mathematical laws. If we move a rook through one column each in four moves, it would have moved exactly 4 columns, neither more nor less. This underlying mathematical relation often goes unnoticed, and so the fact that the actual laws in a game of chess are mathematical is never stated explicitly.

Why laws are mathematical:

Laws have relevance only when the fundamental entities interact. Interaction involves adding up of entities (and their properties) and changes in their positions. The adding up has to follow the law of addition. The changes involve motion; to cause any change, an entity has to move from one place to the other and this requires a certain amount of time. That is, changes cannot take place without motion, and instantaneous changes are impossible. Motion is a space-time relation that follows mathematical laws. Any complex interaction is a series of 'motions' and 'adding ups', and these strictly follow mathematical laws. The fundamental entities do not carry or possess any special laws; they just follow the laws of mathematics.

Mathematics has no role in deciding the properties of the fundamental entities. However, mathematics decides the emergent structures, and and thus has an indirect role in deciding the emergent properties. The emergent structures make the environment different, and the

new environment follows slightly different mathematical laws. Thus it may seem that the environment tends to become infinitely complex. However, the finite nature of the primary causes is self restrictive that emergence can lead to both increase and decrease in causal factors, but not to infinite causal factors and infinite structures.

Determinism/chaos:
As causal factors follow mathematical laws, the changes lead to deterministic end results. Determinism implies lawfulness, whereas chaos implies lawlessness. Causal factors obeying mathematical laws may lead to complexity, but not chaos. Fundamentalism implies that any field of knowledge has a deterministic environment because the laws are mathematical. Determinism, together with top-down causal control and finite nature of entities, brings emergence to a halt; that is, the final structure formed has no bottom-up causal powers.

Such a structure will be very stable and indestructible, and will have a strong top-down control on everything inside. It is something whole, and it becomes difficult to know whether it started out as a whole or as fundamental entities. However, the changes from fundamental entities to the final structure will be logically explainable based on bottom-up and top-down causal factors. Such a stable structure need not be present in all fields of knowledge, because these fields are sub-fields of nature. However, the study of nature should invariably yield a stable structure, if the concept of fundamentalism is correct.

Predictability/ probability:
Deterministic environment makes predictions possible in all fields of knowledge. However, for complete predictability, we have to measure or quantify all causal factors, and practically that may be impossible. Success in prediction depends on the number of causal factors involved. With very few causal factors, events and their end results become easily predictable. Probability equations become useful in some cases. These equations work only in deterministic environments, not in chaotic environments. For example, a dice having 6 faces provides a deterministic environment, limiting the possibilities to just six, and the probability equations work very well. But, if the number of faces varies at random at every throw, we get a chaotic environment, where probability equations are of no use.

Evolution/creation:
Based on fundamentalism, the laws of mathematics decides the emergent structures. So once the fundamentals are given, the changes happen automatically. We can call it evolution, changes that happen without the intervention of an external agency. The causal factors and the mathematical laws together carry the evolution forward. If an emergent structure thus evolved is stable enough to have a top-down control, and if it purposefully controls certain causal factors to suit its need, then we can say that the structure acts as a creator. By selectively controlling the causal factors, the environment is changed and the mathematical laws applicable to the changed environment causes the emergence of something new, a creation. Here, it may be noted that the both the creator and the creation that emerged are allowed structures; that is, the primary-causes and mathematical laws together can explain the formation of these.

An omnipotent creator can create any primary-causes he likes. He can choose to leave it to evolve according to the laws of mathematics, or he can interfere as and when he likes, to cause suitable arbitrary changes that do not follow any mathematical laws (that is, he can

create a chaotic environment by incessantly and instantaneously creating newer and newer things). In the former, we can identify the causal factors and arrive at a model how it works. But in the latter, it is impossible to identify any causal factors, and so we can call it a magic or a miracle. A miracle is something that does not follow mathematical laws.

Dynamic/static:
A static state represents the absence of causal factors. Everything remains unchanging, and so there is nothing to be explained. We are unable to extract any information other than it is static and so it provides no knowledge. So based on fundamentalism, our fields of knowledge represent dynamic structures. If the structure does not evolve with time, but remains static, it is impossible for us to know whether it follows any laws.

Systems/non-systems:
As explained, all our domains of knowledge turn out to be structures regulated by laws, causally-working, deterministic, made up of quantized units and finite. These structures can be called systems, implying there are non-systems. Only from systems, can we acquire knowledge. Thus the most crucial implication of fundamentalism is the definition of a system: Any system is quantized, dynamic, deterministic and finite; absence of any of these characteristics make it a non-system; all systems are governed by laws of mathematics.

Space and time are non-systems familiar to us; both are infinite and continuous. From space and time alone, we cannot extract any information. However, space and time factors connected with matter are quantized and finite, and are parts of systems. A system can be fully explained (that is, all emergent structures, all emergent properties and all causal factors can be explained), based on the primary-causes (fundamentals) and the laws of mathematics. Fundamentalism thus implies that we can acquire complete knowledge in any field.

Fundamentalism as the most fundamental concept

Fundamentalism is a concept regarding knowledge. What is knowledge? Observation provides us with a lot of information. We take these information as real or factual, and analyze these for the causes. This analysis leads us to the causal factors and the laws involved. Knowledge can be defined as identifying the causal factors and laws behind the information we get, and not just the information. However, collecting information is crucial; the more information we get, the more knowledge we can acquire from it.

Why does knowledge exist? The information we get regarding anything remains changing with time. What we actually do is trying to understand how this change happens. Qualitative analysis leads us to causal factors, and quantitative analysis leads us to the laws that each causal factor follows. If information does not change with time, there is nothing to be understood. That is, knowledge exists just because the world is dynamic.

Why is knowledge acquirable? The changes in the world are not arbitrary, but follow mathematical laws. The basic law of mathematics, the law of addition, is completely deterministic, and so the changing world provides a deterministic environment. This makes changes predictable in the case of individual causal factors. This predictability offers the possibility of understanding the relevant laws, and thereby makes knowledge acquirable. If the laws were magical, acquiring knowledge would have been impossible.

All concepts arise from our knowledge, and this makes fundamentalism, the concept regarding knowledge, the most fundamental concept. Fundamentalism implies that we can acquire knowledge only from systems (the attributes of which are given earlier), that fundamental entities possess properties (not laws), and that the laws in any field are mathematical. This like an Occam's razor cuts off infinite, chaotic, continuous and static models from representing knowledge in any field. It also cuts off entities possessing 'laws' and entities possessing 'magical' properties (like, instantaneous action, being present at more than one place / in more one form at any given time) from all our theoretical models.

Fundamentalism implies it is possible to acquire complete knowledge in any field. It offers the only possible way to acquire complete knowledge, and so it is the one and only path leading us to the ultimate truth. Suppose we argue that there are no fundamentals, then everything is arbitrary requiring no explanation; that denies the existence of knowledge itself. Denying the existence of knowledge is a logical fallacy because it is tantamount to claiming that one has knowledge regarding the non-existence of knowledge.

Fundamentalist approach in Physics

Our pursuit of knowledge is itself an evidence that there exists a strong cause-effect relation in nature and everything that arises from nature. Our knowledge about the working of the physical world gives us excellent results, which are factually correct and very dependable. We can explain most of what we observe using arbitrary fundamental concepts. These indicate to a great degree of confidence that there are some fundamental things in nature.

Newtonian Mechanics, Quantum Mechanics and General Relativity, the three major theories in physics, have some kind of fundamentalist approach. However, none of these explicitly states that fundamentalism is the starting point. These theories agree on the grainy (quantized) nature of matter, and the infinite and continuous nature of 'space and time'. However, this infinite 'space and time' have no place in these models; only 'space and time' associated with matter (these are finite/quantized) are used. Thus based on these theories, the fundamentals of nature are quantized.

Based on fundamentalism, the search for the truth behind nature should lead us to a system governed by mathematical laws. The attributes of the system are finite, deterministic, dynamic and quantized. Though the three main theories do not explicitly state these, none of their explanations contradict these. Whether the universe is finite or infinite and whether the expansion may go on infinitely are open questions at present. Fundamentalism provides definite answers for these: the universe should be finite, and the expansion should also be finite. Whether expansion is a one-time process or part of a cycle repeating again and again can be known only after we have arrived at a model complete in all respects.

If expansion is a one-time process, then universe should have a beginning and an end, probably starting out as fundamental entities, and integrating step by step into large-scale structures. If expansion is a repeating process, then universe should have existed forever as a system of large scale structures, never disintegrating into fundamental entities. It is impossible for us to know whether an omnipotent creator is behind all these; he can choose to create it at any time and destroy it after a finite period or he can allow it to remain in a cycle, thus making it appear to be existing forever. We only know that the universe follows

mathematical laws and things do not happen arbitrarily. Miracles, events that defy mathematical laws, have never been observed, and so a creator if any, has left nature to evolve by itself.

Fundamentalism implies that by identifying the fundamentals correctly, we can explain everything using mathematical laws relevant to each situation. Thus it predicts a Theory of Everything. The three major theories together provide us with a lot of information regarding the laws, and that makes the task of formulating a unified theory easier. The concept of fundamentalism spells out the attributes of the model, making it more easier.

Let everybody, those in the mainstream, those in the periphery and even outsiders try their luck in arriving at the unique model, which fundamentalism predicts to exist. I personally favor a Newtonian model (modified to some extent) with just one fundamental particle having four finite properties (mass, volume, energy and force). I have been working on such a model for the past many years, and the result has been positive and encouraging so far.

Conclusion

This essay is an attempt to formalize a concept of 'Fundamentalism'. The concept has been defined and its implications have been explained. Fundamentalism deals with knowledge. It defines knowledge and proposes the method to acquire knowledge: search for the causal factors behind changes, and this will ultimately lead to the primary-causes; the laws that decide the course of the changes are purely mathematical, not magical, and so it is possible to identify the laws; thus identify all the causal factors and relevant mathematical laws in the given field, and you can acquire complete knowledge in that field.

The concept of fundamentalism implies that we can extract information and acquire knowledge only from systems. Any system is dynamic, quantized, finite and deterministic, is governed by mathematical laws, and always have some fundamentals based on which the system can be explained. It is these qualities that make any system something that can be systematically studied. So our pursuit of knowledge is completely based on systems, and any field of knowledge will eventually take us to a beautifully explainable system. Our field of study may include both systems and non-systems. Non-systems provide us with zero knowledge, whereas systems provide us with complete knowledge in that field.

Extending the concept of fundamentalism to the study of nature (physics), we can arrive at the conclusion that there exists a 'Theory of Everything' that can explain everything in physics based on a few fundamentals and the laws of mathematics. It is possible for us to acquire complete knowledge regarding how the universe works. However, it is impossible for us to know how such a universe came into existence and why such a universe exists.

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