The Method of Resolving the Inconsistencies that Stymie Scientific fields

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Abstract

The history of physics teaches us that the resolution of inconsistencies is the reliable path to breakthroughs. What it does not teach us is the method by which Albert Einstein developed the theory of general relativity which resolved inconsistencies, such as that which the disagreement between the Newtonian theory of gravity and the motion of Mercury constituted in astronomy from the time of Le Verrier, and how this method can be employed to resolve other inconsistencies. Notable among these inconsistencies are those which Einstein later aimed to resolve on the path to a unified field theory in which an explanation of quantum phenomena that approximates reality similar to General Relativity unites seamlessly with the latter and those between mono-causal theories of the causation of the illness that follows the effect (disease) of a specific factor and multi-causal accounts that attribute the same effect to the interaction of the many factors that are implicated in the generation of this illness. After 14 years of research that aims to resolve the latter, we developed a form of the method of conceptually approximating reality which, unlike the form employed by Einstein during the development of General Relativity, does not necessitate mathematical conception of the things to be described on the path to mechanistic understanding but only fluency in the non-mathematical language of pure thought which mathematicians may translate into equivalents that permit such conception when this understanding has been achieved. Together, our results reveal that the solution to the problems that scientific fields presently face does not lie in new mathematical or computational tools but rather in acquisition of the capacity to employ this unrestricted form of the method by which Einstein, while forging the path to the mechanistic

understanding of astronomical phenomena, conceptually approximated reality so closely that accuracy characterizes the relativistic models of astronomy.

Keywords: Conceptual reality approximation; Unification

After Galileo demonstrated convincingly with his observations that those speculative propositions which do not have their origin in experience are completely empty with regards to knowledge of reality, it became clear that the philosopher's path to this knowledge must be forged from experience [1]. But Sir Newton assumed that the philosopher can forge a path from experience to knowledge of reality by deducing concepts and laws from the data collected while observing phenomena if certain rules of reasoning are obeyed and that propositions which are not obtained in this manner have no place in the philosophy that is concerned with truth, which he believed to be the same as his experimental philosophy [2].

This belief was stated clearly in the final General Scholium of the book, 'Principia Mathematica' [2] in which his fourth rule of reasoning requires the experimental philosopher to view logically deduced propositions as exactly true or as very nearly true if other phenomena must be observed before they can be considered to be exactly true [3]. *"But hitherto I have not been able to discover the cause of those properties of gravity from phænomena, and I frame no hypotheses. For whatever is not deduc'd from the phænomena, is to be called an hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy. In this philosophy particular propositions are inferr'd from the phænomena, and afterwards render'd general by induction. … And to us it is enough, that gravity does really exist, and act according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea." [2].*

For close to two hundred years, his practically successful theory of gravity [1], which proposed that a planet must move round the sun in an ellipse that maintains its position perpetually if we disregard the motion of the fixed stars and the action of the other planets [2], was seen as true by most philosophers [1]. But the redirection of the discussion about what the Newtonian rules of logical reasoning guarantee from truth [3] is what those famous events that culminated in the appearance of the headline, 'Revolution in Science. New Theory of Universe. Newtonian Ideas Overthrown' [4] have since demanded from philosophers of science, who are concerned with its foundations, methods, and implications.

Contrary to Sir Newton's assumption, despite his inability to account for the cause of the properties of this mechanism that underlies all the motions of the celestial bodies, that gravity acts according to the law he logically deduced from the data astronomers collected while observing them [2], it was discovered in the time of Le Verrier that one of these astronomical bodies, the planet known as Mercury, does not follow the path predicted by the Newtonian law of gravity [4, 5]. And when neither the motion of the fixed stars nor the action of the other planets, including the fictitious one that was named "Vulcan" [5], could account for the observed behavior of the orbit of Mercury [4, 5], whether or not his logically deduced theory of gravity has a place in the philosophy that is concerned with truth became an open question [1, 5].

This question was decisively answered when the propositions that solved the problem which questioned the place of Sir Newton's theory of gravity in the philosophy that is concerned with truth turned out to be those of Albert Einstein's theory of general relativity [5, 6] which were not obtained with the method that he assumed to be capable of deducing from experience, concepts and laws of science that must be accepted as realities like the phenomena that scientists observed in order to glean such experiences [1]. It

became clear that the Newtonian theory of gravity belongs to a philosophy that is concerned with the validity of the rules of reasoning that are obeyed during the logical deduction of theories [3] and not the philosophy that is concerned with the approximation of truth by theories [1], which the conclusive solution of the problem that questioned the place of this theory demonstrated Einstein as competent to teach us on the path to developing the method he employed.

Einstein's theory of General Relativity described how gravity brings about the motion of planets and the consequences of that mechanistic description matched the behavior of the paths of all planets while rendering unnecessary, unjustifiable assumptions which the Newtonian theory must make in order to achieve the same result, such as the existence of the fictitious planet named Vulcan [1, 5]. "It is an entirely wonderful thing that from so abstract an idea comes out such a conclusive clarification of the Mercury anomaly," wrote the astronomer, Karl Schwarzchild in his letter to Einstein following the publication of "Explanation of the Perihelion Motion of Mercury from General Relativity Theory" in 1915 [6].

Those events demonstrated the ideas of the practically successful Newtonian theory, such as "forces operating at a distance," not only to be as fictitious as those of General Relativity but also to have been obtained with a method that does not give scientists the capacity to approximate reality while inventing the fictitious ideas their theories present [1]. What Sir Newton communicated with the statement, "But hitherto I have not been able to discover the cause of those properties of gravity from phænomena, and I frame no hypotheses" [2], is the inability of logically deduced theories to justifiably describe the mechanisms that underlie phenomena which is a consequence of their development with methods that do not terminate the inventions of the mind in knowledge of reality which furnishes the key to mechanistic understanding [1].

What then is the method by which Einstein conceptually approximated reality so closely while inventing General Relativity [1] that the process terminated in a description of gravity which eluded all other theories of gravity, including the Newtonian theory [7] which presented its invented ideas as given realities [2]? This method, which gave General Relativity the capacity to take account of a wider range of empirical facts without the unjustifiable assumptions, such as the existence of a fictitious planet, which the Newtonian theory must make in order to achieve the same result, is that which requires the invention of concepts in a mind which is purged of all preconceived assumptions about reality [1]. And such a mind is one that views what is known about phenomena from experience as a guide on the path to knowledge of reality, and not a source from which this knowledge that furnishes the key to mechanistic understanding can be deduced [1]. And the creative principle by which reality is conceptually approximated resides only in the "language" that is "spoken" by this mind that conducts pure thought [1].

Anyone who considers the fact that Sir Newton's invention of a theory of gravity, which did not terminate in knowledge of the cause of the properties of the mechanism behind astronomical phenomena [2], required the invention of the mathematics of calculus [8] may assume, for as long as the ideas of the theory are viewed by this individual as given realities [2] in accordance with his fourth rule of reasoning [3], that mathematics is some sort of "microscope" that has the capacity to elucidate the phenomena of nature [8]. Indeed, Charles Darwin, who was so influenced by Sir Newton that, in the final sentence of 'On the Origin of Species,' he compared the view he logically deduced from evolutionary data, that all species may have originated from as few as one with view that all the planets have been cycling on according to explanations of the Newtonian law of gravity [9], wrote that an "extra sense" appears to be possessed by people who understand the great leading principles of mathematics [8]. And anyone who considers the fact that the theories in certain scientific fields, such as the biological, are still far from being able to take account of a wide range of empirical facts like this theory that required Sir Newton to

invent the mathematics of calculus may assume that some ‘new mathematics’ which does not yet exist is required to develop better theories in such fields [10].

But upon developing the method by which the scientist approximates reality conceptually, we found that the creative principle which resided in Euclid’s geometry as Einstein invented General Relativity [1] does not have its origin in mathematics and requires no extra sense. What we found is that when it proceeds from step to step with such precision that not a single one of its propositions can be doubted in the manner of Euclid’s geometry which Einstein spoke while inventing General Relativity [1], the mathematical language of pure thought permits the doubtlessness of each step through which a path is forged towards mechanistic understanding to be ascertained long before arrival at this destination.

Our results reveal that it is because the things to be described in the reality that Einstein approximated conceptually while inventing General Relativity have properties which can be represented by shapes and numbers that he was able to conduct pure thought in the mathematical language of geometry which has the capacity to describe such properties and not because geometry is the source of the creative principle that resided in this language. Furthermore, they reveal that Einstein did not employ non-Euclidean geometry, which is concerned with curved, rather than flat, surfaces, in order to geometrize gravity [11] but rather to describe the cause of the properties of the mechanism behind astronomical phenomena that eluded the Newtonian theory [2] – the curvature of the fabric of space, which he represented by the mathematical concept known as space-time [4].

It follows from our results that although Einstein searched for the simplest concepts and the laws that connect them while inventing General Relativity [1], reality will not be approximated conceptually when pure thought is not conducted during the invention, however “simple” the mathematical language spoken

may be. In correspondence with our results is the soberer conclusion that what is viewed as mathematical "simplicity does not automatically bring truth" which was reached when the mathematical structure of General Relativity was examined [7]. It further follows that the doubtless steps of the mathematical language only lead to mechanistic understanding when it is the language of pure thought or a language into which the non-mathematical language of pure thought is translated after arrival at this understanding.

The solution to the problem constituted by the unavailability of the mathematical language to be spoken as pure thought is conducted towards knowledge of certain realities, such as that of quantum reality which requires the description of the molecular structure of matter [1], is thus suggested. This solution is the development of a form of the method of conceptually approximating reality which does not restrict the scientist to the mathematical language of pure thought like the form Einstein employed during the development of General Relativity.

When pure thought is conducted in its non-mathematical language, the doubtlessness of the steps that lead to the mechanistic description cannot be ascertained until the consequences of the description have been demonstrated to correspond perfectly with the data of experience. It is therefore much more difficult to approximate reality conceptually in the non-mathematical language of pure thought than in the mathematical.

We may compare scientists who aim to approximate reality conceptually while speaking the non-mathematical language of pure thought with those ancients who voyaged at such a time in the history of humankind when neither the pictorial language of maps nor compasses existed. Such ancients, who would have been unable to establish the doubtlessness of the steps towards home until arrival, must have found it so difficult to find the way and many must have gotten lost. But some were guided back home by

knowledge of the position of the stars in relation to the direction at night and knowledge of landmarks and patterns that point towards home during the day and they transmitted, by oral tradition, the knowledge by which future generations achieved the same, even after long voyages across thousands of kilometers of the ocean [12]. In the same vein, scientists who believe, in the manner of the ancients, that "pure thought is competent to comprehend the real" [1] will, while employing the unrestricted form of the method by which reality is conceptually approximated, do whatever it takes to achieve the empirical mastery that points the steps of the non-mathematical language of pure thought towards knowledge of realities that are beyond the reach of any known mathematical language.

Conducting pure thought in its non-mathematical language will permit effective communication with colleagues and philosophers of science as well as with the mathematicians who will translate this language or develop new mathematics for the purpose of such translation if they do not already exist. The confusion due to the defects in the exposition of General Relativity in those early days when all scientists, except Sir Eddington and a few others, were not familiar with the mathematical language of non-Euclidean geometry [13] would have been averted if Einstein had first conducted pure thought in its non-mathematical language before translating it into its geometrical equivalents and had become fluent in this universal language of pure thought.

More important is the ability of the non-mathematical language of pure thought to unify different theories while permitting the communication of the unified theory in a single mathematical equivalent into which it is translated regardless of the differences between the mathematical languages in which such theories were written before unification. In this ability lies the resolution of incompatibilities, such as those that Einstein described as "deep-seated in the physical system of concepts" and aimed to eliminate with an

explanation of the molecular structure of matter and of quantum phenomena that unites seamlessly with General Relativity in a unified field theory [14].

Finally, when the unification of knowledge has been made possible in the different fields by the development of theories that approximate reality with the unrestricted form of the method by which Einstein invented General Relativity, the comprehension of the world will follow the combined efforts of scholars in all fields. The consequence must necessarily be an acceleration of the progress of humanity which we cannot imagine at this time.

Declaration of Competing Interest

I declare that there are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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