Phenomenoscience – The Key to the Proper Development of New Concepts in Science

Abstract

There are many today who believe that mathematics is the critical key to theoretical development in physics and that treatises lacking mathematical support are "speculative or philosophical at best, not rigorously theoretical". Mathematics is a wonderful, marvelous tool and can greatly aid in our endeavors – however, it is not, nor can it really ever be, the true key and foundation to good theoretical development. The real key is the careful and effective evaluation and understanding of the actual physical phenomena in Reality. That is because mathematics, and indeed, essentially all of our other tools depend on the completeness and validity of our phenomenological understanding of physically *how* and *why* things actually work the way that they do to ensure that they are correlated adequately and accurately with Reality in a correct and appropriate manner. Since there does not appear to be any term in science today which refers specifically to such a careful and focused endeavor, the term phenomenoscience is herein defined and some of the basic considerations of its use are described as well. The goal is to show why phenomenoscience is critical to the proper progression of science, and to provide some indication of approaches that need to be used as well as the care that needs to be exercised in its practice.

Introduction

We live in a universe that is far, far older than the earth, the sun, and certainly mankind. Whatever the characteristics, properties, and interactions of "Nature" or "Reality" may be, they certainly have long already been as they are today. In the physical world of "Nature", or Reality as I generally prefer to call it, there are real, physical phenomenological reasons behind the why and how of the way that all of those characteristics, properties, and interactions operate in the manners that they do. Note that, whatever they may be, any successful mathematics that may be associated with some given set of phenomena will rarely reflect those critical *hows* and *whys* anywhere close to adequately – for there is usually significantly more to the story than just what is reflected in the mathematics. We may not know what all of those whys and hows are yet, but they are already there and operating – just as they always have been.

The principle role of science is (or at least – it should be!) to observe Reality, and then to discern and learn from those observations and associated efforts as accurately and completely as possible just exactly what all of the actual whys and hows of Reality truly are. That is because such an understanding is critical for being able to ensure that any mathematics that we develop, along with all of our other tools and approaches, are actually correlated correctly and accurately with what is really already happening in Reality. Such knowledge and understanding can be of tremendous benefit to man – the more correctly and accurately we learn to understand, the more valuable that information will generally be to us. Some characteristics, properties, and interactions are fairly evident and thus, relatively easy to figure out and, in general, most of those have long been well understood – both phenomenologically and mathematically. Yet, there are many others that are significantly less evident and sometimes even rather obscure – as a result, there are still a significant number of phenomena in Reality that we have yet to figure out and learn to understand properly. Moreover, there is also a very strong possibility that there may also be more to the story for some of the phenomena that we currently believe that we already understand well – if there is, that additional part of the story would also likely be less evident or even obscure as well. The

more obscure that they may be, the more critical it is for us to use great care in our efforts to discern and determine ultimately how they work, and why they work in the ways that they do.

As we continue to work to expand our understanding, of necessity, we must focus progressively on the ever more obscure aspects of various phenomena in science. As we do, it also becomes increasingly more important for us to focus more specifically on those particular tools and techniques that have the strongest *inherent* ties to Reality. That is because if we don't, it becomes ever more possible and probable that we could get off-track from Reality and find ourselves unwittingly pursuing philosophy and fairy tales that will not lead us closer to a proper, complete and accurate understanding of how *Reality* truly works. Even though it does require considerable care in its proper use and development, the one tool in our entire arsenal that has the greatest inherent ties to Reality is a series of processes and efforts that we shall refer to as phenomenoscience.

Phenomenoscience – is the art and science of ascertaining a <u>true</u> and correct understanding of the actual physical whys and hows of the processes and interactions that are behind the phenomena that we observe in Reality, in order to keep our conceptual (as well as mathematical and other types of) efforts on track with what is <u>really</u> happening in Reality.

A Note on the Terminology

I would originally have thought that the term "phenomenology" would have been ideal, for, from the natural sense of the word structure, it would normally have been a perfect fit. However, upon researching the term, I found that it has already been used extensively in manners and applications that are quite substantially different from, and in some ways even approaching highly contrary to, the sense with which I would have felt that it should have been used – therefore, it was clear that it would never be suitable for this application. I do not know who else might have ever discussed what follows in any manner approaching a comprehensive fashion, for I have never encountered any such, or even any mention of that type of an effort. I would suppose that it would be very possible that there may be similar discussions elsewhere, but if there were, I would not even know how to find them (what terminology would I look for?). Lacking anything better, and needing a term that would reasonably suggest the proper intent of the concept, I have coined the word "phenomenoscience" – for the specific focus is on a scientifically-based study of the true and accurate understanding of the actual real world "how and why" behind the phenomena in Reality.

With that brief introduction behind us, we will propose a basic definition for the term as follows:

> **Phenomenoscience:** The carefully measured study of the actual phenomenological basis of real-world phenomena – in search of a true and accurate understanding of the actual phenomenological "how" and "why" everything works as it does. The focus is on the actual physical phenomenological reasons behind the ways that the processes in Reality actually function and interact in the ways that they do. With such a comprehensive understanding as a background, the developmental aspect of phenomenoscience then involves the process of using whatever existing, properly confirmed, phenomenoscience concepts may be available to help guide the search for a valid conceptual basis for other processes, ones whose phenomenological operations are not yet properly understood by science.

Why Is Phenomenoscience Critical?

Phenomenoscience is absolutely *key* to keeping our efforts of developing new concepts closely tied to, and correlated well with, Reality. Regardless of what we may think or wish, regardless of

what our perceptions or computations may have led us to believe – Reality is what it already is (and always has been!). Nothing that we can do will ever change that. Phenomenoscience seeks to take its clues as directly as possible from Reality; its aim is to get past perception errors and other distractions to reach a truly valid understanding of how Reality actually works, without trying to read into the picture any extraneous philosophy or "wishful thinking" of how we might think that we would "like" things to work. New developments in phenomenoscience must be built very assiduously upon the very best of what we believe that we already know of Reality. It requires great care, and careful attention to details – doing all that we can to ensure that we do not allow inaccurate perceptions, unwarranted or invalid assumptions, or any other sorts of ill-conceived ideas, which are not ultimately correlated firmly back to Reality, to cause us to arrive unwittingly at incorrect conclusions. In general, if some type of process is specifically known not to work some particular given way within any known phenomena or interactions – it is presumed to likely not work that way anywhere else either.

Phenomenoscience is based on the recognition of several basic principles:

1) When properly understood – Reality will always prove to be logical and rational.
2) Reality or "Nature" is full of interactions that can make our observations of it rather complex and the proper understanding of the total picture often obscure – even where many of the more basic principles might be generally simple and straightforward (once they are properly comprehended).
3) Mathematics, to be done correctly, absolutely cannot come first – for it has NO inherent ties whatsoever to Reality – it can readily be used to serve any master.
4) A good, conceptual understanding of the phenomenology behind how Reality really works is the only truly consistently-valid foundation upon which we can build, if we sincerely wish to come to a correct and accurate understanding of how the world around us works.
5) Simplification can obscure a host of critical aspects before they are even recognized – therefore, it is important to be able to evaluate in the midst of complexity.
    a. All clues are considered to be important.

Repeating for emphasis, for it cannot be over emphasized: Once we have it *correctly* and properly understood, Reality will always be found to be fully logical and rational – under all circumstances and conditions; including especially, at all scales and velocities – unfortunately, we just haven't managed to figure it all out *correctly* yet.

Phenomenoscience, as I will be discussing it herein, is something that I have intuitively understood and practiced (with varying degrees of skill) all of my life and throughout my career – it is a highly demanding practice, but it is also something that has served me very well. Since I was always using it, it is something that I have only gradually realized is actually not well understood generally, and is certainly not as commonly practiced properly in today's physics or science, as it ought to be. It is something that is less well understood, and much less practiced, than it was even 100 years ago. Given that I have used it intuitively (with a gradually increasing skill) for a long time, I considered it so very natural that, despite repeatedly encountering difficulties with others, I had not ever really even given much thought to the idea that it might need any separate terminology (let alone a detailed description). I do not know how many times that I have encountered difficulties or confusing problems (on different projects that I have worked on in the past), where the capabilities (as well as the propensity) for practicing proper phenomenoscience (as well as whatever additional understanding might already have been there from other previous efforts) provided significant clues that proved key in resolving the situation. Concurrently, even though they were generally otherwise very capable, once all was said and done, it was not unusual for many of the other

scientists and engineers about me to remain at least partially bewildered and confused, largely because they lacked an adequate background (or even any true interest) in the phenomenoscience associated with the situation. They had been too well schooled in the "modern" way of thinking and doing things.

Unfortunately, basic logical and rational conceptual thinking, let alone phenomenoscience, are not really taught or promoted in today's science (they are generally relegated to "classical" physics) – in fact, they are almost totally shunned and ignored by "modern" physics and the so-called science that has been built up around it. Approximately 80-100 years ago, with the emergence of so-called "modern" physics in particular, mathematics was essentially promoted to become what is now commonly thought by many to be the most important tool in science, where many have called it either the "Queen of science" or the "language of science". The unfortunate result has been the development of a whole range of concepts and ideas that, despite extensive mathematics to go with them, are riddled with paradoxes and conundrums, and which are often totally devoid of rationality and logic – as well as now, multiple generations of scientists who have been carefully schooled on that "new" way of thinking. From a phenomenoscience real-world type of perspective – it has been an almost total disaster.

The worst of the problem essentially began with a series of "discoveries" and observations that seemed to fly in the face of many things that had been thought to have been well understood before. Most especially, many of the most serious and prominent problems in physics today arose initially with relativity and quantum mechanics, while over-extrapolation of the equations of "General Relativity" and the misinterpretation of cosmological redshift also led in turn to the concept of the "Big Bang" – which added significantly to the fracas a little bit later. The most serious distractions emerged as mathematics were developed that "happened" to provide results that were numerically consistent with what had been observed – even though many of the associated concepts were totally irrational and illogical. The real root of the problem was that there had not been adequate phenomenoscience completed on those phenomena prior to the acceptance of the associated (and deeply flawed) concepts with their corresponding mathematics. Failing to reconcile any of those concepts with past standards of acceptability, mainstream science effectively decided to abandon the old standards of logic and rationality and thereafter to embrace the "successful" mathematics – sans intuitive concepts.

How does Phenomenoscience relate to Philosophy?

With efforts that do not have a heavy dose of mathematics infused throughout from the very outset, many today have a strong tendency to label those efforts, ones such as would be common for the carefully structured results from good phenomenoscience, as little more than philosophy or conjecture. Despite overt appearances, phenomenoscience is distinctly different from philosophy. There are some similarities, in that both try to combine and recombine various bits of observations, knowledge, and understanding in order to reach some new level of insight and comprehension. While both at least seek to use logic and rationality, with philosophy, one is free to dream up anything that one might be able to imagine – so the field is quite literally wide open. All subjects and areas of thought can be considered in whatever way the philosopher may wish or somehow think prudent. On the other hand, with true phenomenoscience there is a very focused and earnest effort to let Reality guide the way to go, as well as to verify the result – generally only allowing possibilities that our current understanding of Reality indicate are reasonable and as consistent as possible with what we already know of Reality. Note that: sometimes it is also necessary to consider ideas that are not fully based on known phenomena as we venture more into those areas where we do not currently have adequate knowledge and understanding yet.

However, even when such is necessary, we still must base our explorations on known phenomena as much as possible, but more important, when all is said and done – the final results absolutely must produce results that are fully consistent with Reality. There certainly needs to be every possible effort made to ensure that it actually and correctly relates to real-world phenomena. The purpose therefore of phenomenoscience is very assiduously to keep our conceptual development efforts specifically on-track with Reality. Note also that mathematics can serve philosophy just as well as it can serve good science – many seem to not realize that any mathematics that are developed without the critical understanding that only good phenomenoscience can provide is actually nothing more than mathematical philosophy until proven otherwise.

Reality already IS – regardless of what we may think or feel, regardless of what our perceptions or ideas may be. The central goal of phenomenoscience is to develop and expand our understanding of that Reality as accurately and correctly as possible without getting off-track from the real world. Phenomenoscience ultimately must not be based on baseless assumptions, unfounded guesses or "wishful thinking" – that is (too often, at least) the realm of philosophy. We also need to avoid blind speculation (where, for example, mathematical exploration, without the benefit of a good, solid, Reality-supported phenomenological basis behind its equations, is actually an excellent example of "blind" speculation). We need to make every effort to ensure that, as much as possible; it is Reality, *and only Reality*, that provides us with the needed clues of what will work or what will not – and in the end, it is Reality that also provides the final verification of whether or not we have actually managed to succeed. There are actually quite a few types of interactions or correlations that mathematics will allow that have NO corollary in Reality – one of the principle functions of phenomenoscience is to help us to understand properly what those Reality-based limits are in order to know how to properly apply and limit our mathematics. Admittedly, that is a rather ambitious goal.

How Does Mathematics Properly Fit Into the Picture?

Mathematics and the other tools that we use must be well grounded in, and correlated carefully with, Reality for them truly to function properly and usefully for us in physics and science. Mathematics, in particular, is a highly flexible tool and has absolutely NO inherent ties whatsoever to Reality – except, of course, for whatever correlations we manage to imbue it with when we formulate our initial equations. Which means that we need to have at least a pretty good idea of the *how* and *why* behind any phenomena that we may be seeking to model, so that we can ensure that the equations truly provide a reasonably valid model of those phenomena. As a result, it is absolutely critical for us to have valid guidelines and concepts to go by whenever we seek to do so. Otherwise – our mathematics will only be blindly codifying potentially wide-open *philosophical* concepts, where the resulting mathematical results could very well be leading us carefully (and computationally "accurately") off-track from the truth of Reality (instead of keeping us on-track with the truth – as is our intent).

Mathematics can provide some extremely useful feedback that can help to keep its results focused somewhat within whatever concepts or limits were imbued into its *original formulations*. However, if those formulations, as well as all of the ensuing calculations and techniques, were not guided by careful phenomenoscience – the resulting equations could just as easily be leading us surreptitiously off-track from Reality as not. That can (and has!) become particularly troublesome in those situations where the end result of our calculations also just happened to be in good numerical agreement with the observed experimental results. Such situations are all too often construed as "absolute proof" – something to which it actually does not necessarily equate.

A. Mathematical equivalence has raised its troubling head into many areas of science over the years, some of which have still not been resolved. This can be particularly troublesome when some or all of those starting equations and/or values are somehow empirically based – where the starting results are "tweaked" until the final "answers" deliver the desired result. Such an approach is sometimes unavoidable, but, when such is the case, it needs to be performed most carefully – with good phenomenoscience to guide it – to ensure that we do not just end up somehow fooling ourselves. Unfortunately, mathematical equivalence can very often be rather difficult to recognize. Just because a set of equations, based upon some particular set of starting theses or ideas, happens to give us "good" answers does not mean that it is the only set of formulations that would do so. Certainly, it must often be the case that there is actually only one mathematical approach that actually "works", but all too often – far more often than most realize, there are actually more than one. Sometimes there may be only two, but more often than we would like, there can actually be three or even more different sets of mathematical equations which could all provide numerically equivalent answers from the same basic data, but which might each imply distinctly different phenomenological reasons for the function or interaction under consideration. Sometimes (when we are lucky), we may actually be aware of all of the possibilities that there really are; but, alas, all too often, we probably are not.[A] The kicker is that it is very difficult indeed to know for certain when we are not. Whenever it may happen to be that we are not – there is always a very real chance that, somewhere out among those unknown possibilities, resides the actual phenomenologically correct, yet mathematically equivalent alternative – one that we are not even aware is out there. Thus it is that: numerical equivalence of the calculated results with observed experimental outcomes absolutely does NOT constitute adequate verification or proof that our mathematical formulations are actually an accurate reflection of the truth of Reality.

Some have gone so far as to say that, "Papers lacking mathematical support are speculative or philosophical at best, not rigorously theoretical." While such may seem to be the case, especially given the current emphasis on mathematics as a critical foundation, it is certainly not necessarily correct, particularly under some specific sets of circumstances. For example, *any* efforts to pursue theoretical development on a strictly mathematical basis, *without good phenomenoscience to back it up*, would be questionable at best and potentially reckless at worst. Mathematics can be used to support speculation and philosophy just as readily as it can be used to support good science. Moreover, and this is a very real and serious hazard, when mathematics is thought to be the "key " to "good" theoretical work – its presence can actually cause us to mistake speculation or philosophy as "good theoretical science" when it actually is not. To be done properly and reliably, it is very important that, <u>before</u> the mathematics are pursued, there needs to be a concerted phenomenoscience effort with reasonably supported conclusions. Depending on the nature and

---

[A] In truth, we actually do know of some of them, where there have been competing mathematical formulations, which would in turn be associated with totally different conceptual ideas, that are known to produce the same mathematical results*. In many of those cases, science has treated the conflicting, alternative approaches as though they were synonymous with each other (apparently, because they have not been able to discern which of those different approaches were actually valid). It should be clear that only one (if any!) of the known possibilities in such cases could actually reflect the way that Reality actually works. Mathematics is totally incapable of resolving such dilemmas, only good phenomenoscience holds the potential for a satisfactory resolution.

* One specific example is "wave functions" vs. Richard Feynman's "sum-over-paths", used to explain interference effects of, say, electrons, when there is only one electron at a time traversing a double-slit configuration. There are certainly other good examples, but we will not be covering or citing them specifically here. There is a good discussion of that particular combination of conflicting conceptual ideas in pp 105-112 and note 7 of chapter 4 in <u>Elegant Universe</u> by Brian Greene. Note also that in that particular example, it is actually very probable that neither of those mathematical approaches, along with their associated conceptual pictures, are actually a correct reflection of what is truly happening in Reality.

complexity of a given effort, it is entirely possible that there could be a highly valid, rather extensive, phenomenoscience based, *rigorously theoretical*, treatise that would have little or no mathematical support – where the mathematics would properly only come later in the process.

Mathematics is highly flexible – it does not have any *inherent* connection to Reality whatsoever. That is why it cannot be safely used to "lead" the way forward.

Anyone who thinks that mathematics effectively separates science from philosophy needs only to take a good, close look at science today. Since mathematics has NO inherent ties to Reality (and this is a critical point that cannot be overemphasized!) – mathematics can just as readily be used to support philosophy as it can to support good science. It is most unfortunate, but there is actually a great deal of philosophy – heavily loaded with rather impressive looking mathematics – that is masquerading as good "science" in today's mainstream physics and science. The end result of any mathematics can be no better than the initial appropriateness and validity of whatever equations that it may have happened to start with. We need to understand very clearly that mathematics is a tool that can be used to support almost anything by a suitably clever person. So also, unfortunately, can even phenomenoscience (if it is carelessly practiced) or any of the other tools in our bag of tricks and tools also be misused.

On the other hand, if properly and carefully done, phenomenoscience has the very closest *inherent* ties to Reality of any of the tools at our disposal. Thus, we always need to implement it as thoroughly as we can, and then use it to maximum benefit. Nonetheless, the only way that we can reasonably hope to avoid such problems as allowing the over-dependence on any of our tools (such as mathematics) to quietly and surreptitiously let us drift well off-track in our thinking, is to make sure that we use every appropriate tool in our "bag of tricks" – especially those that have some sort of essential tie to Reality. We maintain that, central among those tools is the careful and proper use of phenomenoscience, although there are times when some of our other tools provide some excellent augmentation to that which phenomenoscience can provide. Often times, phenomenoscience may be the only tool that will actually have significant ties to Reality. That is very specifically, why phenomenoscience is the true key to the proper development of new concepts in science.

Mathematics is indeed a part of the language of science, but it is only a part – it is neither the root language nor the root of the language, it is only an adjunct. Albeit, it is a very useful and important adjunct – still, it is NOT the root! That is a very critical part of the problem in today's physics, for there are far too many who have been led to believe that mathematics actually is, indeed, the root. It gets even worse when some carelessly misinterpreted (but mainstream accepted!) concepts are used to conclude that, for example, at least in the "quantum world", *anything* that can be made to "work" in mathematics must also be considered a very real possibility in Reality. Unfortunately, I have seen that rather insane premise repeated far too often as "fact" by highly acclaimed mainstream physicists. There are some rather impressively substantial areas of "physics" today that are actually nothing more than highly speculative mathematics (with rather heavy doses of philosophy as well), where, because they occasionally manage to obtain numerics that match some observation or another – they are considered to be "well verified". However, as already noted, numerical equivalence of the results does not constitute either verification or proof that the calculations that were used to obtain those results were actually a correct reflection of Reality.

Despite the fact that I had recognized that there were major problems in physics, initially, even I was not truly aware of how deep they were, nor that even our overall approach was seriously in error. Thus it was that early on – just as I had been carefully taught to do – I, too, kept dutifully returning to the mathematics in my efforts to find out what might be missing or in error. It took me

some time before I finally fully realized that the critical keys to the needed answers weren't in the mathematics!

Eventually, I realized that: since it is the only approach, which, if done correctly, consistently provides an inherent tie with Reality, it is phenomenoscience that is – and should be recognized as – the true root of the language of science. Until it is recognized as such and is reintegrated properly and thoroughly back into physics and science where it belongs, we will not truly be able to get physics, and the science that is derived from it, back on track with Reality. Please do not misunderstand, mathematics still needs to be there, and actually plays a rather significant and crucial role, but it is neither the proper foundation, nor is it at the true heart of good science.

The bottom line to all of this is simple –
Mathematics not only often fails to properly address the true, physical "why" or "how" of the way a given phenomenon acts and interacts in Reality, but, because it does not do so, it will also allow many things that Reality will not. Only good and careful phenomenoscience can help us to know what those critical limits and factors are and to make sure that they are all properly considered.

We desperately need to correct our thinking.

What Does Good Phenomenoscience Entail?

This is a rather ambitious question to try to answer. Phenomenoscience is a highly interactive and complex process, and it requires great skill to do correctly. It is not really formulaic, nor does it lend itself to concise explanations. What we will be presenting below is really only an outline of some of a few critical highlights – an attempt to present enough to give at least some idea of what it really entails.

Because phenomenoscience is so very interactive, it is also highly demanding. It is one in which the investigator – one who needs to be a very earnest and dedicated scientist, meaning that his (or her) true interest is primarily the discovery of the truth of Reality, rather than the promotion of their own pet theories or ideas – must be very careful to let Reality point the way to go. It is critical that any that may embark on such an effort fully recognize that ONLY a truly accurate and valid understanding of the truth of Reality will provide us with the optimum opportunity for progress and future development. Phenomenoscience does not lend itself to a fixed set of steps or procedures that will always work in the desired fashion. However, there are some general approaches and critical understandings for getting an adequately valid foundation, and then building on it, that can be used; and these are primarily what we will be outlining in just a little bit.

The primary and essential goal of phenomenoscience is to: 1) Understand phenomenologically how Reality actually works. And 2) To ensure that any new concepts associated with our efforts at developing and expanding that understanding are actually as closely and firmly associated and correlated with Reality as is possible.

Scope of What Needs to Be Done If we wish to understand what phenomenoscience truly entails, it is critically important first that we also comprehend the scope of the effort, including some idea of how difficult some of those tasks and endeavors are likely to be. In concert with that, here are several significant areas of concern that can help us to understand the true scope and nature of the problem better:

1) Because most of the readily apparent and straightforward phenomena have already been reasonably well deciphered, it can be essentially guaranteed that those areas where our knowledge and understanding are as yet incomplete will be at least relatively obscure – and

thus, rather difficult to accurately discern. That is because, after all of the time and effort that already have gone into understanding the world around us up to this time, those areas that are relatively obvious and evident or reasonably straightforward will already have been figured out, at least somewhat correctly, by someone somewhere along the way. Thus, because of the inherent difficulty of trying to ferret out whatever questions or unknown factors may be left, it is expected that it will truly require a rather well developed skill in the art of accurate and valid phenomenoscience to have any reasonable hope of true success in any current or future endeavors. This signals that a rather challenging effort yet lies ahead of us.

2) Not even everything that we may presently "think" that we already know is actually correct. There are two general sets of problems that fall under this category.

   a. So-called "modern" physics is plagued with a number of very significant paradoxes, conundrums, and irrationalities. Despite the current popularity of accepting such a condition as an accurate reflection of Reality, to someone who is well practiced in the art and underlying concepts of phenomenoscience, this is an abundantly clear indication that there are some very significant, even serious, problems in science today. Regardless of the rather broad acceptance of the current situation by many in the mainstream physics and scientific communities, these irregularities are more properly recognized by many other very good physicists and scientists as clear evidence that "something" must be seriously wrong with some of our leading theories. A substantial part of the problem is that, as of yet, no one has been able to identify and gain broad acceptance for an understanding of exactly where the errors actually lie, nor especially, of what the resolution ought to be. There have certainly been a great many ideas forwarded by many physicists and scientists throughout the world, in an earnest effort to resolve the situation, but, as of yet, the problem still persists. Until something at least reasonably close to the correct ideas (accurate as related to the actual truth of Reality) are developed and advanced, and where some sort of consensus can subsequently be reached (with a good, solid phenomenoscience basis to support it), those problems will inevitably remain unresolved. This is a very serious problem.

   b. There are also other hidden – and not so obvious problems that have not even been recognized yet – problems that still need to be resolved. This is a problem that, essentially by definition, many do not even seem to realize that we have. It is certainly more of a problem than most appear to recognize. Some of these are bound to be related to questions that we may not have even encountered yet (as in areas that might only become clear to us as we eventually come to comprehend more about phenomena for which we do not yet have a full and accurate understanding). Perhaps even more significantly for now though, as noted in sub-concern "a." above, it is already clear that there are major problems that are unresolved (which irregularities are unfortunately not even widely acknowledged in the mainstream as actually being a problem yet). Given that such is truly the case, it should likewise be reasonably evident that there very possibly are going to be some additional, more obscure, problems hidden out there among all of the "trouble-free" phenomena that we might "think" that we already do know completely and correctly. For example, there could be (and, I believe, there actually are) some very familiar and thought to be well-understood phenomena where there is actually significantly more to the picture than "we" currently realize – where there might be some "hidden" or very obscure features that are critical to understanding other, more complex, phenomena correctly. In particular, there is good reason to believe that there are one or more of just such oversights that could actually end up being the key for resolving at least some of the problems noted under sub-concern "a"

above. Once again, if they are not even recognized currently as having problems or of not being correct, then the nature of both the error and its resolution should also be recognized as evidently being somewhat obscure, and certainly less than obvious. These are the types of problems that can make phenomenoscience very challenging – yet also very rewarding if we ever do finally manage to get it "right".

Principle Axioms of Phenomenoscience Phenomenoscience is based initially on careful observations and analysis, but logic, rationality and intuitive consistency are also critical factors in getting from those observations to a better understanding of what physical characteristics and real-world interactions are actually behind the phenomena being observed. It is, of necessity, built upon the very best of what we already believe that we know. In order to do that in an orderly and consistent fashion, it is critical to have some ground rules to go by. There are not a great many of those basic rules or axioms, for the primary driver absolutely must ultimatey be Reality itself. In effect, these ground rules are really an effort to classify some of the most critical considerations, as well as some of the most consistent features of Reality, and as such, they are a few basic principles that need to be kept firmly in mind. We will detail the primary set of ground rules in just a little bit as the principle axioms of phenomenoscience. However, before we do, there is one other highly critical point that we need to address.

Science appears to have had a lot of different meanings or definitions to different people over time. Whatever any particular individual might think its proper definition is, or should be, is most important – for it can have a great deal of impact upon how they approach the different observations and developments in science, and there from, how well any one of us might ultimately do in getting closer to the truth. One particularly prevalent and trouble-causing perspective today appears to be that we cannot call it "science" unless we can somehow "measure" and "test" it. While such may seem to be a rather rational and "down-to-earth" approach, it would also seem that those who hold to such a perspective must be blithely unaware that we already make extensive use of multiple parameters that we can actually neither "measure" nor truly "test". We will reference one as an example in a moment or two, though there will be more that will be referred to later. The point that we are trying to make is that we really need to keep our definition of science somewhat basic – and free from unnecessary, and ultimately unfounded constraints, so as not to arbitrarily and unwittingly limit ourselves somehow – which could, in turn, keep us from being able to discern as much of the truth of Reality as possible.

The focus, and thus, the basic definition of science needs to concentrate specifically on discerning the truth of Reality, whatever it may actually be – as accurately and completely as possible – by any appropriate means, with all possible care to keep ourselves from veering off-track from the truth, without any artificial or arbitrary constraints (such as detectability or measurability). A key point behind this is that there is absolutely no valid reason whatsoever for us to presume that if something exists; we should actually be able to detect and measure it. A very quick example of such is neutrinos. We have been able to discern interactions involving them, and from that, we have a few rather solid indicators of at least some of their properties (although, unfortunately, there are also a number of other popularly held and taught "properties" that actually are ultimately based on nothing more than unsubstantiated assumptions!). However, we truly do not have (at least, as of yet) any means of truly detecting or measuring them directly – all we can really do is to infer their presence from occasional interactions that make it abundantly clear that something has happened. Nonetheless, based on what we do have, there is very good reason to believe that they actually are real, even if we have yet to correctly and fully discern what their true nature really is. It may be imperfect, but it is a beginning. Given that we already know of, and actually extensively use, some phenomena that are truly undetectable and cannot be directly measured, phenomenoscience

presumes that there are very likely bound to be more – some of which we are very probably not even aware of yet.

Therefore, the root perspective of phenomenoscience with respect to science in general is actually relatively simple and reflected in the following suggested definition:

> Science is the art and practice of observing and evaluating Reality, by whatever means are available and appropriate, in order to discern the truth of Reality as accurately and completely as possible.

With that in mind, let us now take a look at the principle axioms of phenomenoscience.

Principle Axioms of Phenomenoscience

I. All primary clues must come from Reality – careful observation and evaluation are critical.
   A. It is most imperative that we use every means possible to get beyond appearances to the true heart of what is really happening.
   B. Ultimately – Reality is *always* rational and intuitive.

II. Reality is consistent.
   A. Basic principles always hold – at all scales, velocities, and circumstances. Whenever it may seem that they don't, we need to figure out what other influences may be affecting the apparent outcome.
   B. The truly basic principles may usually be conceptually simple, but the combinations of interactions that might arise out of the interplay of those basic principles can lead in turn to great complexity.
   C. When all is said and done, everything must fit and work together in a fully rational and consistent manner

III. We must not presume that we can directly perceive or discern everything that exists in Reality – for if we do, it would be too easy to overlook something critical.
   A. There is actually very substantial evidence that there are some very significant, already accepted and heavily relied upon aspects of Reality that are not directly detectible and therefore not testable either.
   B. We still need to make every effort to ferret out the truth of Reality, whether we can readily detect and measure it or not. Nothing is irrelevant in Reality – for the correct understanding of some aspects will very often depend on the correct and accurate understanding of multiple other aspects of what is about us.
   C. When we cannot measure or discern directly, we must infer – but we must do so only most, most carefully, for a proper understanding depends on it. Yet, the final outcomes arising out of all inferences must still comply explicitly with all of the other Principle Axioms.

Phenomenoscience requires close and careful attention to the basics and all of the details, as well as a careful evaluation of all of the complexities *without simplification*. Simplification, or attempts at simplification – especially when we are not properly and fully aware yet of how Reality truly works, will generally tend to camouflage or hide critical details, which can lead in turn to significant misinterpretation, misdirection, and error. All too often, the "devil" is in the details – they cannot be ignored! Similarly, it is also most critical to beware of similarities in appearance, which are often only reflections of our limited abilities to observe all of the pertinent details. Just because two

separate phenomena may manifest “equivalent” features or seem to exert the same effects under at least some conditions (meaning that we cannot readily discern the difference between them by direct observation), that absolutely does NOT signify that they are truly the “same” or somehow physically “equivalent”! This particular type of misperception has led to some very significant misunderstandings in “modern” physics, for under such conditions, the mathematics would also naturally be expected to work exactly the same for both. Nonetheless, just because they may seem to be observationally, and even mathematically, indiscernible from each other, that does not necessarily indicate that they are truly physically identical or equivalent – very often, they are NOT!

Despite a great deal of currently popular belief otherwise, Reality is NOT counterintuitive! It may be complex. It may have some hidden secrets that we have not yet been able to ferret out correctly. The complex interactions that are everywhere in Reality may result in some rather convoluted and complex observations that are rather difficult and tricky to figure out and correctly decipher. However – and I have encountered a wide range of situations throughout my career that have consistently corroborated this – once we actually do get some phenomenon figured out correctly and at least reasonably completely, it has ALWAYS proven to be extremely rational, logical, and intuitive. I have not found that there have ever been any true exceptions whatsoever. Whenever there might have seemed to have been some sort of exception at some earlier stage in the process, it was always only a matter of time before some additional key points were somehow eventually identified that once again made all of the seeming irregularities clear and understandable. When Reality is correctly understood, it has inevitably proven to be breathtakingly elegant and beautiful! There is no truly valid evidence to indicate that such should not prove to be the case everywhere and under *all* circumstances. Phenomenoscience therefore presumes that such is indeed the case, and that the universe that we live in is fascinating, intuitive, and will ultimately prove to be absolutely comprehensible and fabulous.

It may seem oxymoronic to say this, but there is a very real “art” to learning to read what we know of Reality well – one which needs to be carefully developed in order to extract as accurate of a reading of the physical phenomena behind the observations and data that we have available as is possible. This is a skill that can only be developed over time, by carefully observing what we know about a wide range of phenomena, and then working to understand the (sometimes rather subtle) patterns that begin to emerge. It is most important to be able to get past evident perceptions to real events and interactions – which in today’s world all too often entails also rethinking what one has been taught. Some of the basics can certainly be taught by teaching students about what is seen and then explaining what the corresponding *physical hows and whys* of the phenomena and interactions are (although any such efforts in today’s educational system are generally woefully inadequate at the present time). *Very critically important* – just understanding what the associated mathematics may reflect is not *nearly* enough. It can also help to teach about alternative concepts that have been conjectured in the past and *why* they have not been deemed appropriate or correct – once again, this needs to be done on a solid phenomenological basis (this is also usually done inadequately). If in either of these cases we do not really yet understand what the actual phenomenological basis is, or which of several possibilities it may be, then we need to teach that carefully and thoroughly as well. Nonetheless, to become truly adept at the art of proper and accurate phenomenoscience, it is important for anyone who desires to do so to study all of the phenomena that they can on a consistent basis in order to develop a somewhat intuitive feel for how Reality tends to work and how to “read” it properly. The goal of such an effort is to learn how to let Reality lead the way in order to reach an appropriate comprehension more quickly, with fewer dead ends and false starts. This becomes particularly important when one is seeking to expand the envelope of our understanding and develop new phenomenoscience-based concepts to cover areas that have not been deciphered yet.

Repeating for emphasis, even an exhaustive understanding of the mathematics behind all of the phenomena involved would not be even remotely adequate for such a capability. There is typically much more to the actual phenomenological understanding than what is given in the mathematics. For good phenomenoscience to work, the understanding absolutely must include the detailed *hows* and *whys* from a physical, phenomenological perspective.

Given that as a background, let's now lay out some critical stages in a general overall approach that have proven to be critical for getting ourselves onto a reasonably firm foundation and thus, essential for us to have any reasonable hope of success at getting physics and science at least somewhat back on track with Reality.

I. Foundation Stage of the Approach: First and foremost, we need to ensure the following. Whatever information we may believe we already do have and comprehend "correctly" – meaning, whatever our current understanding for <u>all</u> of the "known" phenomena in Reality may be – is, in fact, truly as correct, accurate, and complete of a description of how and why those aspects of Reality actually work as is possible.

This is a requirement that cannot possibly be overstated. It is unfortunately an all too often unrecognized fact that there are a great many concepts taught in physics and science today as "known" phenomena and interactions – where the actual phenomenoscience behind them is either not properly supported or even contrary to what good phenomenoscience could in any way support. Stated a different way, there are a great many "facts" taught in science today that are not truly based on good science. If we are going to use the known phenomena as a foundation upon which to build, it is absolutely critical that we make every effort that we can to be sure that it is as solid and valid of a foundation upon which to build as we can possibly make it. This, unfortunately, is not a trivial effort.

For example, all too often, in our zeal to "know" and feel that we "understand", we sometimes get a bit over zealous and overconfident in our conclusions and statements of what we have actually managed to either verify or disprove, even when sometimes the accepted concepts may actually happen to be counterintuitive or irrational. This has proven to be a particularly strong tendency where the associated mathematics also just "happen" to produce answers that match numerically with what we observe in Reality; or sometimes perhaps – where there may be no known alternative concepts with which to compare or contrast it, or which might possibly be considered as alternative phenomenological possibilities. Thus it is, that there are a great many "facts" and "conclusions" in physics and science today, which are taught and promoted as certain knowledge – that do not necessarily have *any* true basis in fact. There are definitely some facts and information in which we can have a great deal of confidence of their accuracy – or at least that they are very near to the truth. There are others where a close evaluation of the supporting evidence is inconclusive at best – which means that we cannot at this time really be sure if the conclusions are correct or not. Finally, there are also far too many bits of information where a close evaluation of the currently available evidence will reveal that the commonly held conclusions are perhaps dubious at best, or clearly incorrect or overstated at the worst.

With so very many faulty bits of "information" already out there, we cannot afford just to go blindly forward. For us to implement good phenomenoscience it is absolutely imperative for us to go back first and review absolutely <u>*everything*</u> that we might think that we already know – all of this is essential to ensure that we have as good of a feel as possible of which "facts" are really and truly correct information. This means going back to the basic observations and the "evidence" that is used to support the accepted conclusions. Far too often, it has proven to be the case that the evidence is actually not as conclusive as is commonly portrayed. [For example, (and this is

reflective of only one type of possible situation) one type of a possibility is where it is clear from certain observations that option "a" is not correct; so it has been concluded that it *"must"* be theory "b". However, in some of those cases there are actually one or more (very often unidentified or unknown) other possibilities, in addition to "b", that would also be expected to yield similar results. Thus, "b" would not truly be the only other possible option. Such situations have occurred more than once.] Honest and sincere efforts to complete such careful reevaluations to this point have revealed that there are far more of such problems out there than there really ought to be, certainly there are quite substantially more than are generally realized. Wherever we may find that there are principles about which we actually *ought to be* uncertain, we then need to understand the extent and nature of those uncertainties as best as we can, so that we do not put too much confidence in questionable information. Where information is dubious or clearly incorrect, we need to add those phenomena and interactions to our mental list of areas for which we need to see if we can, at least eventually, somehow gain a good and valid – or at least, better if possible – understanding.

This next point may not seem to be an important consideration for some, but it can actually be quite crucial for gaining the kind of understanding that we may need for finding the truly correct answers and understanding that we are seeking. Just as important as understanding what we truly do know or that has been adequately proven as being correct, is having a correct understanding of what has and has not actually been "disproven". Sometimes, when the results of some experiment or another do not come out *as expected or predicted*, the tendency is to throw out or dismiss the entire concept as though absolutely all aspects of that particular theory had been shown to be incorrect, when only certain aspects of it might actually have been. The key here is that it is just as important to make sure of the validity and accuracy for those bits of information where we are fully confident that we truly know that "such and such" isn't so, as it is to verify what we actually do know. All of the experimental evidence that we have available to us, whether it is in the nature of confirmation or discredit, needs to be properly understood for what it truly signifies (and is not overstated), for the negative information can sometimes provide as much insight as the positive information does. Moreover, we do not want to discount some possibility inappropriately when it has not actually been disproven.

Note that, while it is critically important to have a good foundation and background in a broad range of physics and other scientific disciplines, concepts, and principles, along with their associated histories and derivations, good phenomenoscience is NOT really built on "scholarly" work in the usual sense. While the ideas of others can sometimes be helpful in triggering ideas to consider and possible avenues to pursue, the real basis of phenomenoscience is a thorough and very careful evaluation of Reality itself, and of a variety of ideas with respect to what we know of Reality. In doing such, extensive reference to other's ideas can often actually be more of a hindering distraction than an asset. The proper focus is not on who said or wrote what, where, or when, but rather on whether or not what is commonly held truly makes coherent sense – and if so, *why*; then again, if it does not – *why not* (in which case, what else then might possibly do so, and once again, if so – *why does it do so*?)? *WHY* and *HOW* are the most critical aspects of understanding throughout phenomenoscience – for they are where the most crucial bits of insight arise from. The fame or renown of whoever may have promoted any given idea (whether initially or subsequently), does not necessarily reflect the actual correlation of a concept with Reality, neither does how widely it is accepted or promoted do so either. The crucial test in phenomenoscience is not in how many references there may be in any given treatise, nor in the "scholarliness" or accepted "validity" of those references. The crucial test of phenomenoscience is only in how well the final outcome truly matches and correlates with Reality itself when everything is finally put together. Note that, if the picture that finally emerges out of the phenomenoscience is truly accurate, it will constitute a rather coherent picture that will smoothly transition across *all*

scales and concepts in an essentially seamless manner. There will not be paradoxes or conundrums to get in the way; nor will there be major disjoints that force different areas to be dealt with in totally isolated and differentiated manners without a straight-forward, well-understood transition between them (totally disjointed treatments are far too often the case in "modern" physics). That may be a rather tough target to aim for, but anything less would be woefully inadequate.

Unfortunately, as has already been averred, the number of questionable, dubious, or downright incorrect "facts" is rather long, and the reasons for their questionability are not always obvious or straightforward. If they were obvious or straightforward, there would not likely be a problem with them. This is only meant to be an overview article on phenomenoscience. Thus, any effort to discuss some of those points in significant depth (including a careful discussion of the full rationale behind all of the considerations), and certainly any effort to approach any sort of comprehensive discussion of examples of such incorrect or overstated information would be well beyond the scope of this discussion. Nonetheless, for the sake of understanding and perspective, we will proceed to highlight just a few examples in an effort to provide some insight into the nature and scope of the problem. We will provide a brief description of the nature of the problem for each, but we will very purposefully not attempt to provide any sort of a complete or comprehensive support for the stated position herein.

Example 1 – Time Time may seem to be a rather simple and straight forward concept – it is certainly one that we are all very familiar with and which we "measure" and use extensively all of the time – but, is it really? Actually, no it is not! We do use or refer to it frequently – it is almost ubiquitous throughout physics and science, where it is a critical parameter associated with a great many phenomena. It also seems that most people, both inside and outside of science, appear to believe that, somehow, we actually DO "measure" time. Nonetheless (and there are certainly many who do not realize this), the simple fact is that we have never once actually *measured* time, for time is intangible – it has no substance whatsoever. There is absolutely nothing out there for us to "measure". We cannot measure time (nor will we ever be able to do so), we only mark it – we find some sort of reasonably regular process and then count cycles or some sort of other reasonably consistent or repetitive occurrence associated with *that process*. We carefully tally up and calibrate those counts to mark whatever time intervals we may happen to be interested in at the moment. For many areas of endeavor, such "technicalities" are not really a concern or even a significant consideration, for marking time is often just as good for them as "measuring" it could ever be – however, for some other areas it can be an extremely vital bit of understanding. One specific example of when it is particularly critical has to do with the so-called "verification" of "time dilation". Mainstream physics claims to have confirmed that particular phenomenon, which was predicted by the Theory of Relativity, through several significantly different approaches – and therefore to have fully verified that it is a very real part of Reality. Unfortunately, such is not the case at all, for we were not actually measuring time, but only *marking* it. All that we have *really* verified was that the end result of the time-marking processes that were used (cosmic ray decay rates in one case, and atomic clock oscillations in the other) reflect values that are in good numerical agreement with the calculated expectations derived from Relativity under the conditions that were being tested. There is absolutely no means whatsoever for us to validate clearly, experimentally, whether it was some phenomenological effect associated only with the marking process itself, an actual change in intangible "time", or some combination thereof that had actually "changed". In short, "time dilation" has not actually been verified at all. We do know that something changed, but we really do not have any proof of what it really was. It would require too much to discuss this topic further here, but it has already been covered in more detail elsewhere. We will provide the general location for at least one such discussion just a bit later in this paper.

Example 2 – Conservation of Energy and Momentum The conservation of energy and momentum is one of the principle pillars of "classical" physics, where it is still held to be inviolate. Moreover, there is a great deal of highly valid evidence to support this concept – it has been well verified, and has consistently been an absolutely critical element in many of the observed interactions, as well as in the associated classical physics calculations in order for them to correlate properly to Reality. Phenomenoscience presumes that Reality is exceedingly and persistently consistent, which would mean therefore that something as basic as the conservation of energy and momentum would be correspondingly *inviolate* at all scales and time frames – with absolutely *no exceptions whatsoever*. Moreover, it is *highly* irrational to get "something" from "nothing" – even if only "momentarily". Yet, "modern" physics has several glaring examples of concepts that actually presume – and even require – gross violations of that principle, with the only limiting "requirement" being that the prescribed time period for any such "violations" are correspondingly constrained such that we could never actually detect them (i.e. they are effectively "hidden" by uncertainty). Naturally, such criteria, by definition, would ensure that we would never actually be able to confirm whether or not such ideas are truly correct via observation. (How very convenient…!) [The actual nature and basis for "uncertainty" is another area of significant misunderstanding, but we will not discuss that here.] Phenomenoscience would consider such (conjectured-only) possibilities as clearly unacceptable because they would require the unequivocal violation of a well-verified principle of Reality in a way that cannot be justified by any rational means. [Note also that each of those conjectured-only concepts are associated with some seemingly rather convincing mathematical formulations that have been carefully *tailored* to provide answers that just "happen" to match the desired real-world observations that they are intended to "explain". This is an excellent example of where math can be used to provide the appearance of validity when it is not properly associated with valid phenomenoscience.] One particularly blatant example of the violation of the conservation of energy and momentum in "modern" physics is the seemingly popular and widely promoted concept of "virtual" particles – which has in turn spawned a multiplicity of equally irrational (and incorrect) dependent concepts as well. There is certainly much more that could be said, but that will have to do for now.

Example 3 – Harmonic Motion This is a concept where the significance of the point that we will mention here may seem to be subtle and perhaps insignificant (at least to some), but it actually has very important application for understanding the nature of light, and ultimately, matter and energy as well. Harmonic motion and corresponding, associated processes are encountered everywhere throughout Reality – at all scales, and associated with a great many phenomena, and its properties and interactions have been extremely well characterized, especially mathematically. It is ubiquitous in electronics, and is unquestionably a very significant factor in the characteristics of both light and matter, especially at the quantum level of atoms and individual particles. One of the most basic characteristics of harmonic motion, one that is rather evident almost everywhere, is that it is always the outcome associated with some sort of *unstable* condition in a resonant system – an energy condition of some sort that is created and then somehow left in an unstable state. The oscillation that is so characteristic of harmonic motion only arises as some sort of an unstable condition alternates between different energy states as it repeatedly seeks to find a stable state to "settle" into, until all of that unstable energy ultimately manages to dissipate. Note particularly that if the initial condition is not unstable – it does not oscillate! This is particularly obvious and reasonably well understood in such phenomena as pendulums. It is also very evident in electronics, for it is a critical factor in the design of oscillators. However, when it comes to understanding light, this aspect has been overlooked and essentially ignored. Light has been abundantly shown to be able, quite literally, to travel astronomical distances of thousands upon thousands (and even millions upon millions) of light years, and for corresponding periods of time – while perpetually exhibiting very clear and evident properties of harmonically oscillating fields. These fields certainly do not "appear" superficially to be unstable or deteriorating in any significant

manner. Yet, to be consistent with the well-established basic characteristics of harmonic motion, which are rather evident and well verified with all of the other known applications in the rest of Reality as well, phenomenoscience would indicate that there simply must be more to the picture than is evident on the surface. It would certainly indicate that the commonly accepted concept for the composition of light (as composed only of a harmonically oscillating electromagnetic field) is rather substantially inconsistent with this particular property of harmonic motion. When this principle is considered then, it would seem clear to a skilled practitioner of phenomenoscience that there absolutely MUST be more to the picture than is commonly believed. Once again, that will have to do for now.

Example 4 – The "Aether" Also known as the "Ether" or the "Luminiferous Ether", the spelling "Aether" is currently preferred by many to avoid confusion with ether gas. This particular example is meant to illustrate an example of a generally overstated "disproof". As generally taught, the Michelson-Morley experiment is considered to have disproven the concept of an Aether as a "medium" for the transmission of light. In truth, it did disprove the concept *as it had originally been specifically conjectured*, as well as several alternative variations that have also been proposed – more specifically, essentially anything that might cause light to travel at a different speed near the surface of the earth in one direction relative to another. Essentially, what it did demonstrate is that if a light beam is split and sent in two orthogonal directions and then recombined, it is not possible to discern any shifting of the number of cycles between those two directions, regardless of how the apparatus is oriented. Does it unequivocally demonstrate that there is no such thing as an Aether, or some other sort of Aether-like, or even Aether-unlike, background environment that we cannot directly detect or discern? No, it does not. If such does exist, from those specific experimental results we do have some clues of a few properties that it does not exhibit. Beyond that, good phenomenoscience would recognize that the possibility for some sort of background environment that we cannot (or at least, have not yet learned to) directly discern, or possibly even recognize as perhaps having to be there, yet remains as an open question.

There are many more points that could be cited, but we will not present any more examples at this time. We will just say here that while some of those points are sometimes somewhat subtle and not necessarily always critical, there are also times or areas where the insight from a correct understanding can actually prove to be rather basic and far-reaching. They can truly run the gamut. If you are interested in further examples or discussion of this topic, or in more detail – there are a few of them, ones that were significantly relevant to the topics discussed therein, that are covered to varying degrees of greater detail in *The Theory of Field Interaction*[1]. While the cited discussions are not truly comprehensive even there, I would suggest that they at least would be a good place to start. Unfortunately, I do not know of any other specific references where this particular aspect is covered in any significant degree. I very seriously doubt that at this time there are any discussions anywhere that even attempt to approach any sort of comprehensive treatment.

Before we finish our discussion of this initial stage in phenomenoscience, there is one very significant difficulty that should be noted in relation to this foundation step of the process – one that actually would apply in varying degrees to all of the steps that will be outlined. This particular difficulty is actually a very significant part of the reason why the "art" of good phenomenoscience needs to be developed very carefully, earnestly, and thoroughly by anyone who hopes to practice it in the exploratory search for better understanding. It is truly an "art" as well as a science – any such effort is subject to significant judgment, and sometimes to substantial complexity; therefore, it would be realistically possible that it might be difficult to find even any two skilled individuals who could reach total agreement on a reasonably comprehensive list in the early stages. This does not mean that this step (or any of the later ones either) should be considered invalid or ignored. Nor does it mean that phenomenoscience is somehow fatally flawed. All that statement really does

mean is that, with the incredible attention to detail that is required, we need to recognize that even with the very best that we may be able to achieve – this is still a sensitive process. Nonetheless, there is also a rather significant "ace" in the hole, one that is specifically designed to help keep us out of any serious trouble.

The final stage to the overall approach process, which will be detailed later, is one in which a careful, global-scale look is taken at the whole picture. The primary purpose for that part of the process is primarily as a final check, specifically to ensure that any errors that might have been made in *any* of the earlier steps are identified and rectified. While it may not be possible to prevent wasted effort from earlier mistakes, it is meant to ensure that the final outcome is truly as valid as can possibly be achieved. As a result of such safeguards, perhaps, over time, and with some very careful work, we (meaning the physics and science communities) will eventually be able to develop an ever-increasing list of concepts, ideas, and principles where at least almost everyone can agree that there is a rather solid basis.

The real key to the significance of this foundation stage in the effort is that almost every other tool and technique that we use in physics and science depends in a very real way for the ultimate confirmation of its validity on our completing this first step as correctly, completely, and accurately as absolutely possible. That is because this step is crucial for ensuring that those other processes and efforts are adequately and correctly tied and correlated to Reality. If we truly strive to be very careful and to do our utmost best in this effort, over time, we should be able to get ever closer to the truth.

Only after this foundation stage is properly done would we actually be ready to proceed to the next basic phase in phenomenoscience.

II. Second stage of the approach: We need to take our foundation principles and interactions and then build on them, to see how much of the rest of the "known" phenomena of physics and science they may perhaps make phenomenologically clear, or at least, clearer.

The basic idea here is to take all of the now felt-to-be well-substantiated basic principles that, after the completion of the foundation stage, appear to have been properly developed and verified; and then, to put them together with as many other basic principles and other observations to see what additional insights can be gained. The primary area of focus is still on areas and observations with which we are already somewhat familiar, but where because of higher degrees of interaction, the overall picture tends to be quite significantly more complex, and perhaps seemingly more varied than those areas that had been considered previously. There are actually several outcomes expected out of such an effort. They are as follows:

1) The first outcome is the systematic tackling of some of the more complex phenomena and interactions in physics. This is something that is best performed only after the first stage is completed so that the inappropriate dependence on uncertain or incorrect principles does not unwittingly contribute to incorrect conclusions regarding some of the more complex phenomena and interactions. This is not yet an exploratory stage, so the focus is only upon phenomena and interactions that are thought to be rather well understood already.

   Just as with the basic principles reviewed in the foundation stage, this stage in the process is certain to reveal a significant number of additional phenomena and interactions where the current thinking is either incorrect or at least inaccurate or incomplete. Some of those problems will become clear because one or more of the basic principles upon which the previously accepted interpretation had been based will have already been identified as either questionable

or incorrect. Such a circumstance would of course also bring the more complex phenomena or interactions under question. Some of the others may be based only upon basic principles which have already now been properly verified, but the more rigorous criteria entailed in phenomenoscience will reveal that the subsequent conclusions that had been originally derived do not necessarily follow from those basic principles as solidly or clearly as had been promoted. As before (with the foundation stage), any of the more complex phenomena and interactions that might come under question, yet which cannot be resolved somehow, will need to be kept in mind as at least dubious or possibly even incorrect for all further efforts.

2) The second outcome is as a partial crosscheck of all of the efforts that have already gone before. This is a very critical consideration that is used to help to ensure that any conclusions that are ultimately reached are as valid as is humanly possible. If there happen to be any errors that show up at this stage in the effort, it would be most critical to go back and address anything that might have contributed to those errors – in a very specific effort to save time and effort later on in the process. Because the unavoidable exercise of judgment is required throughout all stages of the phenomenoscience process (as, despite what some may think, it truly is with all of our tools (including mathematics!), it is most critical that there be a continuous and perpetual effort to crosscheck our results in every way possible. This process of constant crosschecking needs to be a perpetual and pervasive part of all of our activities, in a very concerted effort to keep the final results of the overall effort as absolutely valid as is possible.

We will not be providing examples for this stage of the approach because any appropriate area that we might want to cover would be generally far too complex and involved for such a treatise as this. Even the examples that were used for the initial stage were only very basically introduced (and could have used significantly more discussion), and any topics germane to this stage would normally warrant discussions that are quite significantly more substantial to cover them properly. The basic principles are the same as with the initial stage, so those examples are considered to be still applicable here, except that at this stage, the principles and interactions upon which they are based will tend to be more complex and convoluted.

However, there is a sort of example that recently arose in the news, which presents a rather good example of the confusion that can arise in the absence of such comprehensive phenomenological understandings as those to which we have been referring. I personally prefer very strongly not to criticize anyone's sincere efforts (whether I may personally agree with them or not!), so I am only citing this reference for illustrative purposes – primarily because I believe it demonstrates the situation so very well. This is, in effect, a counter example. It refers to a combination of ideas in mainline physics that reflect a rather extensive effort to "prove" something that I would maintain good and effective phenomenoscience would indicate is not really a problem, while also seeking to resolve a range of other "problems" that are ultimately really based more on assumptions than they are on actual fact. Whether or not any of this has subsequently been published in any of the professional physics journals I do not know, it was "new" news at the time this was written. There was an article published in the New York Times on 17 May 2010[2] that discussed the problems associated with how the presumed perfect balance of matter and antimatter during the "Big Bang" should have sort of wiped everything (each other) out, and thus, guaranteed that we should not even exist. They were excited because some of their experiments indicated that instead of a perfect balance, they had some measurements in which there was an imbalance with a small but significant surplus on the matter side. I will not try to discuss the details in the article, nor all of the problems associated with the effort that were glaringly present from a phenomenoscience perspective – such a discussion would require far more than could be covered within a reasonably sized paper.

However, I will mention a few pertinent points. Why the universe is composed of matter instead of antimatter is among the topics that are already covered in *The Theory of Interaction*, as are a number of other considerations, all of which clearly indicate that there are also absolutely no valid reasons to believe that there ever really was a "Big Bang" either. Certainly, there is no real, valid evidence to support such a concept – it all starts with some very poorly supported assumptions and blindly extrapolated mathematics (whose true phenomenological basis is also not properly understood). [This is actually an excellent example of where knowing and verifying the true how and why behind an observed phenomenon can make a very big difference in interpretation. The idea that redshift is a result of Doppler is purely an *unsupported* assumption, ultimately based primarily on the fact that no other "viable" phenomenon had, as yet, been identified that could properly account for what was observed. The lack of a truly valid "known" alternative is a very poor basis for assuming and promoting that the only "accepted" alternative that can be made to fit all of the pertinent observations somehow *must* be correct! Similarly, the use of the equations of gravity in General Relativity and extrapolating them to such extremes, without first understanding the actual phenomenological basis is also foolhardy. Mathematics will certainly allow it, but Reality will normally interject certain types of limits into the system that will not be apparent until the phenomenological basis is properly understood.]

Now, getting back to the question of balance between the formation of matter vs. antimatter – the phenomenoscience-based concepts that are discussed in *The Theory of Interaction* indicate that, *all else being equal*, if there ever really was some sort of "beginning", there should indeed be no inherent initial preference between matter and antimatter. Given that many do apparently believe that there was some sort of a beginning, there do seem to be a goodly number who subsequently believe that the universe should be nominally either half-and-half or self-annihilating. However, all things aren't equal. In the overall picture, the only real consideration that truly matters for where things are today is that, because of the ways that they interact so strongly, only one of them can ultimately predominate, which (not surprisingly) just happens to be the one that we refer to as ordinary "matter". Even if they were to have initial imbalances that were relatively small and random, so also would the differences in the intensities of those imbalances tend to be rather variable. As a result, eventually, even if both could have somehow actually "started" out equal, one or the other will inevitably reach some critical point where it would thereafter predominate sufficiently such that the imbalance would only progress more or less monotonically from there until the other actually becomes rather rare. Thereafter, the overall balance would never, ever really change significantly. Once that basic understanding is developed; the underlying concept is basically rather simple and straightforward, but it is also based on understanding, ideas, and concepts that are an outgrowth of an extensive phenomenoscience-based effort. Thus, the true core of the idea, though relatively simple itself, cannot be properly understood without the more basic understanding of the composition of photons and matter that are introduced earlier in the book. Any attempt to introduce those concepts here would be far beyond the scope of this paper.

Another essential key concept that is presented therein is that, were someone to just happen to dwell in an "antimatter"-predominated universe instead, their view of the Reality about them would still look essentially the same to them as our "matter" predominated universe does to us. (There would be some charge reversals and such, but, because of their perfect reciprocity [as well as the arbitrariness of their designations], they would not really be aware of them.) Thus, if it had happened to be "antimatter" that had ultimately predominated in our universe (instead of "matter"), then we would have been referring to "antimatter" as matter, while we would have correspondingly referred to "matter" as antimatter – and we would have been none the wiser. As far as to the experimental results cited in the newspaper article that B-mesons produce about 1% more matter muons than they do antimatter muons, it is critically important to consider that we already do dwell in a highly polarized "matter"-predominated universe. Thus, any final conclusions that those

observations are even significant (i.e., not markedly affected by the already-present "matter" predominance), especially from a phenomenoscience perspective, would certainly be extremely premature at this point. It should be rather obvious that there could certainly be a very strong possibility that any such effect would simply be a result of the fact that we actually already do live in a preponderantly "matter" universe. That is a concern that would likely take a rather extensive effort to resolve. Thus, at this point, their "positive" results are not seen as necessarily representing anything useful, at least – as of yet.

Perhaps the primary point of this example is to illustrate, even if only briefly, the wide range of areas that must be considered when evaluating some of the more-composite areas. There is a great deal of detail that must be carefully considered before any solid conclusions can be reliably reached.

The end goal for this second stage is that "we" develop a rather comprehensive understanding of what we can be truly confident of – of what we do and do not properly comprehend with respect to how Reality works from a physical phenomenological perspective. Mathematics that produce answers that are consistent with the observed results are, or at least should be recognized to be, very clearly not enough – and, in fact, may not yet even always be available at this stage in the process. The real, critical understanding that we need to start from is phenomenologically WHY and HOW the phenomena and interactions actually act and respond as they do – WHY Reality ultimately acts as it does. What are the actual physical reasons behind the ways that Reality works? Keep in mind that an understanding of what we do not properly comprehend phenomenologically yet is also every bit as important as is a good understanding of what we do.

We have already pointed out that where there appears to be nominally good agreement between the answers that arise out of some of the extant mathematics and what we observe in Reality, but where those concepts are also plagued with paradoxes, conundrums and other irrationalities – phenomenoscience would indicate that there is a problem somewhere. The unresolved problem would be to determine what the nature of the problem is and where to find the answer. We have already alluded to the idea that there could well be unknown alternative concepts out there where the corresponding mathematics would ultimately result in numerically equivalent answers. Assuming that such is indeed the case, part of the challenge for phenomenoscience would be to see if we could somehow possibly identify what some of those alternatives might be, so that we could evaluate them to see if ultimately they might possibly actually fit better. Such would certainly not be a trivial challenge, but it would be a most critical one to strive to address during this stage of the process. If more than one possibility is subsequently identified, then each possibility must be thoroughly evaluated.

The outcome of this stage becomes the foundation upon which our two following stages will build.

III. Third stage of the approach: This stage, which is still phenomenologically based, pertains to the process of striving to expand our knowledge and understanding of Reality, and is actually two highly interactive aspects that are designed to help ensure a reasonably valid output. If done properly, it should serve well to keep the outcome appropriately in line with Reality.

The first aspect involves the highly interactive and conceptually challenging effort of looking throughout all that is confidently known of Reality for clues and parallels to whatever phenomena are being evaluated in order to ferret out hints to what some of the possibilities might be for what phenomenology might actually lie behind the observations in question. The idea behind this aspect is to use what we do know of Reality to try to limit the wide-open range of possibilities that we might need to consider, and to help us to home in on the most likely prospects more quickly.

That is the preferred approach, for it is a very purposeful effort at letting Reality actually point the way for us to think and consider – in as efficient of a manner as is possible. Of course, that cannot always be expected to give us what we may need. When it doesn't, we may have to get a bit more creative in our thinking. Even so, we must ever be most, most careful to keep our thinking corralled within the known bounds of Reality, and especially, to crosscheck any new ideas carefully against everything that is known, to make sure that it is at least rationally and logically consistent with all that is already felt to be confidently known of Reality.

The second aspect, which is highly interactive with the first, is the follow-on effort of checking whatever ideas might arise out of the first aspect, against whatever else it may be expected to affect – once again, with anything and everything else that are already felt to be well known and understood. The purpose of the second aspect is very simple – it is a conceptual phenomenological test of whatever might arise out of the first aspect to make sure that it actually does fit logically and rationally in with all of the other well "known" ideas, without significant difficulty.

As noted before, at this period of time, with centuries of effort and progress behind us, and despite the problems that we have encountered more recently with "modern" physics, we are already at a somewhat sophisticated level in the developmental process of our understanding of Reality. Thus, any unresolved questions that remain to be resolved are expected, quite logically, to be significantly less than obvious and likely involve details that are rather obscure. What that truly implies is that even the most sincere of efforts by even the most practiced and capable of phenomenoscience practitioners is likely to result in a great many dead-end ideas during the first aspect of this third stage in the process. Without phenomenoscience, it is basically like groping around blindly in the dark, with no idea whatever of where to look or even possibly of what to look for. Phenomenoscience can provide a variety of ideas of where to look and possibly, of what to look for, but because of the obscurity of the clues, there are bound to be a great many possibilities that may need to be considered. Many of those possibilities will likely fail even a careful phenomenological evaluation against what is known and has been observed about whatever phenomenon may be in question – those can be fairly quickly dismissed. However, there will likely also often be multiple possibilities that might pass such a test – those are the ones that will need additional phenomenological evaluation using the second aspect approach.

Thus, although many of the initial possibilities would be expected to be eliminated during the first aspect evaluations, there could still be several – to perhaps many – of those possibilities that would require the more thorough evaluation embodied in the second aspect. This is a significantly more complex and involved procedure, which is why it is important to eliminate as many possibilities as possible in the first aspect – while also being very careful to not eliminate anything that might actually yet be viable. The basic approach is simple in concept, though often rather challenging to carry out in practice. Each of the possibilities must be evaluated carefully and thoroughly against anything else in Reality with which there might be some sort of interaction or influence. The question to be answered is whether it fits with all else that is known in a consistent, rational and logical manner – does the total, overall picture still make sense when this newly conjectured concept is included? If it does, *why* does it work so well? If it does not, *why* does it not work so well? If there might still be other ideas to consider, do any of them work equally as well as this one does, and if they do, *why* do they appear to do so? The ultimate target or goal would ideally be to narrow down whatever possibilities remain to one particularly promising one that works exceptionally well – with no paradoxes or conundrums to deal with.

If some of the possibilities seem to work only partially, or if none of the possibilities seem to work adequately overall, then it is time to return back to the first aspect to see whether some of the possibilities might need to be modified a bit, or if there might be some other possibilities that might

have been somehow overlooked. Characteristically, the process of going through the second aspect will often uncover additional considerations or ideas that might also need to be covered as part of a reevaluation of the first aspect process.

This stage of the process very well could – and often will – require multiple iterations back through the first and then second aspects before any degree of success might even begin to be realized. Whatever the case may be, and regardless of the effort that it may ultimately take – it needs to be carried on as long as may be needed until a good overall picture finally develops that appears to meet all of the criteria, and which also provides a rational picture for the phenomena under consideration. If, perchance, there are other (generally of the more basic) phenomena than those that had originally been considered, which emerge to also warrant reconsideration as part of this process, the overall effort can become rather daunting and challenging to consider as the overall complexity of the effort becomes ever more substantial and far-reaching. Nonetheless, it is critical to continue on, incorporating all that may ultimately appear to warrant consideration, until a rather complete and consistent picture eventually emerges. It is most, most critical not to ignore any details or problems that may happen to arise, for those are the types of feedback that are often the most useful in ferreting out the truth. Only once a coherent and reasonably comprehensive picture is finally developed would it generally be appropriate to continue on to stage four in the process.

Keep in mind that while it may be tempting and possibly even fruitful sometimes to delve into stage four efforts before completing stage three, that is very much a matter of judgment. Sometimes, such efforts could produce results that could help guide the completion of stage three. However, it is also very possible that a too-rapid entry into such efforts could prove to be just a waste of time and resources at best, and very possibly distracting and misleading at worst. The best combination of approaches will tend to vary with each situation, and therefore it is critical that they be left up to the investigator – and that they are considered most carefully before proceeding.

IV. Stage four of the approach: This stage deals with follow-on efforts to confirm any of the new conclusions or concepts that may have ultimately emerged out of the previous approaches through such supplementary techniques as targeted experimentation, mathematical development, or any other confirmation procedures that might be warranted.

Stage four is where we make the final checks to ensure that the “rubber” of phenomenoscience one again truly “meets the road”. It is the point where all of our other tools, including such mainstay tools as mathematical development and experimental verification – all led by the new ideas that have been developed – are used to test, and thereby to potentially confirm, as best as is possible, whether or not those new ideas are as well correlated with Reality as had been thought.

Phenomenoscience is absolutely critical for good science, for without it, we have no real means for ensuring that everything else that we do, all of the other tools that we use, are truly correctly and properly correlated with Reality. However, it also cannot operate alone. For us to be able to operate properly in conjunction with “Nature” or Reality, phenomenoscience must ultimately come first, or we have no valid means of ensuring that everything else actually reflects Reality properly. Yet, all of our other tools are equally critical as a final or near-final crosscheck to verify to us that we can have confidence that the results that have come out of our phenomenoscience efforts actually do *still* reflect Reality as well as we may have thought that they would.

Using mathematics, we need to develop any equations that may be missing to cover any new ideas or aspects of ideas that may not have been there before – based, of course, on those new ideas. The (ultimately non-conclusive) test for the mathematics is, of course, that the answers that arise out of those mathematics actually provide a good numerical match for what is already known,

as well as for anything that may also come out of any new experimental results as well. That test is non-conclusive because all that a good numerical agreement of the results will actually verify is that the outcome of the equations is at least in numerical agreement with Reality – that it does not *discredit* the concepts upon which the mathematics are based. With mathematics, only numerical disagreement will tend to be significantly conclusive. While it may only be a start, it is at least a start, and rather often, a pretty decent one.

Experimentation will usually be another critical tool in this process. Typically, if there are some truly new ideas that have come out of the phenomenoscience efforts, there may very possibly also be some particular aspects of the phenomena or interactions of interest that may have never been considered (or tested for) before. The ideal approach is to take any such new and peculiar ideas (relative to anything before) and develop some particular experiments or setups that would hopefully provide some sort of discriminating feedback for comparing the new ideas with whatever might have been previously available – and then to run some tests based on those new ideas. How conclusive any such tests might be will depend very heavily on the nature of the phenomena or interactions in question – it will also depend very much on the actual nature of the experiments as well, and ultimately, on what can actually be observed or tested. Once again, just as with mathematics, while a negative result or a lack of correlation can be a rather conclusive indicator that there are some serious problems with some given set of ideas, a positive answer or good correlation will not necessarily always provide solid confirmation. Just the same, whatever can actually be obtained should again help to provide a reasonably good place to start.

Ultimately, we will want to use each and every tool that might possibly be applicable, in order to get as much confirmation (or possibilities of counter-indication) as is possible. If there are counter-indications from any of our other tools, those results should be used to return as far back in the process as necessary to see if the added clues might help us to figure out where we might have gone wrong, and from that, how to correct our thinking. Of course, in such a case, it would be critically important for us to repeat all of the corresponding crosschecks as well. On the other hand, the more positive, or nominally confirming results that we can amass, the greater confidence that we can have that we have actually gotten a bit closer to the actual truth of how Reality really does work.

Phenomenoscience is most definitely not easy to accomplish well – which is certainly one very good reason for its dearth of effective practice and lack of popularity. Incomplete or shortsighted conceptual thinking, which is really sort of an attempt at phenomenoscience that is done poorly, has contributed quite substantially to physics and science difficulties and side-tracks over the centuries. This is also a rather significant reason why so very many distrust and avoid phenomenoscience today. Even so, it still constitutes the critical key for keeping our scientific efforts on-track with Reality. It will truly never do for us to shun it or to try to substitute the wrong tool (such as mathematics, for example) in its place as the foundation for physics and science. While mathematics, for example, may have a rather rigorous set of rules for orderly progression from the initial formulations to the final result, there is no inherent means for ensuring that the initial formulations are actually correct and appropriate without good phenomenoscience to lead the way. Moreover, phenomenoscience is also critical for helping us to know which mathematical techniques and limits are properly applicable to the mathematical calculations associated with any given phenomenon. In short, mathematics is far too flexible of a tool to be safely used without something like phenomenoscience to guide how to properly use it in coordination with Reality. The proper answer therefore is to cultivate the practice of good phenomenoscience carefully, among as many as are both willing and able to do so properly. It requires extreme care and focus on detail to avoid being fooled by incorrect perceptions and ideas. There are no real shortcuts to doing it well.

The final approach – where we do all that we can to verify, or at least corroborate the ideas that have been developed as thoroughly as possible – if done carefully and properly, is where our true confidence in the correctness of the concepts and ideas arising out of phenomenoscience can finally be fully established. If we continue carefully to persist in such efforts in a suitably appropriate manner, we should be able to gradually progress toward an ever greater and more accurate understanding of Reality and the world around us. Phenomenoscience is absolutely key to good science, and needs to be reintroduced as the primary foundation before science can have any possibility of getting back on track, but, to do so, we absolutely must practice it correctly and carefully. On the other hand, if we fail to reestablish phenomenoscience as the foundation upon which we need to build, it is guaranteed that we will not be able to get "science" back on track with Reality, let alone to be able to keep it on track in the future.

Conclusions

Physics – and therefore, science as well – are off their moorings. There are problems with even many of the basic principles; and perhaps even more critically, some of the approaches and techniques that are most favored today are the wrong ones! Until we correct our approaches and techniques, we will not adequately be able to make a proper course correction. Moreover, because of the multiple errors in even some of the basic principles, as well as a variety of other fallacious interjections of unsupported assumptions – we must go back to the very basics and most carefully reevaluate everything. Until we do, we will not be able to rectify the situation in a manner that will allow us to get back on – and then stay on – course with the truth of Reality. Phenomenoscience is the Key for doing so. It is a highly challenging endeavor – but it is doable.

We will never be able to get physics and science back on track until we learn that, especially with theoretical development, good, effective phenomenoscience needs to be the true foundation of our developmental efforts. In particular, good, solid phenomenoscience absolutely must precede and guide the development and evaluation of our mathematics (as well as our other tools). Where such is not reasonably possible, *any* mathematics that are not so supported need to be held in question until valid phenomenoscience results can be developed for the phenomena and interactions to which they are meant to apply. Mathematics has absolutely NO inherent ties whatsoever to Reality, and thus, it can just as easily be used to lead us off-track from Reality as it can be used to keep us on-track. The outcome from any mathematics can never be any more valid or appropriate to the truth than are the accuracy and correctness of the correlation imbued in the initial formulations upon which those mathematics are based – and that can only be established through good, careful, and effective phenomenoscience. Where many in "modern" physics appear to regard mathematics as the foundation and language of physics (and science in general), we – meaning the greater science community – need to get to where we realize that the true foundation needs to be carefully and properly executed phenomenoscience.

T. B. Bon

References:

[1] T. B. Bon, *The Theory of Field Interaction*, published on-line at the following web site: http://tbbon.net/, 1st ed., 2009. Note: Though the term phenomenoscience is not mentioned anywhere therein, phenomenoscience is what underlies the entirety of the treatise and is the approach upon which it is based. The treatise covers a great deal of territory, so the coverage of the different phenomena and interactions that are discussed therein were not intended

to be thorough, just covered well enough to support the points that needed to be made. Moreover, there was no attempt to present anything even remotely resembling a comprehensive identification of all of the areas of concern that are present in physics today – only those areas which were specifically germane to the topics at hand were included.

[2] Dennis Overbye, "A New Clue to Explain Existence", news article published on line by the New York Times on May 17, 2010, and a version of it appeared in print on May 18, 2010, on page D4 of the New York edition.