The Rationale for Challenging Existing Theory

"...the Greek philosophers invented a new tradition – the tradition of adopting a critical attitude towards the myths, the tradition of discussing them; the tradition of not only telling a myth, but also of being challenged by the man to whom it is told. Telling their myth they were ready in their turn to listen to what their listener thought about it – admitting thereby the possibility that he might perhaps have a better explanation than they. This was a thing that had not happened before."[2] And one might say: has seldom happened since.

The scientific texts included here challenge time-honored and by all accounts thoroughly validated physical theories – hardly the myths of prehistoric times. This audacity of what might be called 'crank' science must be addressed.

Crank science, like science fiction, is characterized as belonging to one or the other disparate category. There is 'hard' science fiction and there is pure fantasy. Likewise, crank scientists either propose alternative but logically consistent theoretical interpretations of experimental data or they merely express a naïve misunderstanding of existing theory. These books engage in the former category. Even though conforming to proper scientific methodology and introducing no false premises or fabricated experimental data, some justification is to be required since there has been no acknowledgement by the scientific community of any pressing problem allegedly solved here. So why would a scientist seek answers to questions that have not been asked?

Scientific theories are refutable conjectures. It is refutability that distinguishes them from mere senseless blather. There are three consequences of a theory that necessitate its rejection:

- failure to predict experimental results,
- internal inconsistencies of the formalities of the theory,
- and incompatibility with implications of other major theories.

There is a degree of arbitrariness to decisions regarding whether failure of one or more of these criteria has been met or whether it constitutes a sufficient refutation. Instrumental success of a theory weighs heavily on arguments for refutation – more heavily one might think, than the search for truth demands.

Intuitive notions often arise when one first becomes familiar with a branch of physics. These sometimes involve doubts with regard to accepted theoretical derivations such as questions with regard to why investigators had made *this* assumption rather than another or defined *this* constraint rather than another. If we follow their decisions at all these junctures, we arrive at *this* theory rather than another. Ultimately one comes to believe that there could be no other. There are aspects of Robert Frost's famous poem that apply:

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

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[2] Karl Popper, "Toward a Rational Theory of Tradition," ***Conjectures and Refutations – the growth of scientific knowledge***, Routledge & Kegan, London (2002), p. 170.

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I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.

This is only the first and final verses which shows that the analogy is apropos. The question always remains, what if one had taken the other path. What if, instead of assuming only a constraint on physical values at infinity, an appropriate boundary condition had been established at the origin – as it should have been. At what point should one cease to challenge accepted theory, a year, a decade, a century. What is the 'use-by' date for unasked questions?

Alternative myths may never have been adequately presented before the appropriate audience to provide a more robust selection process. They may have been overlooked as counter to common sense as Einstein's conception of the 'law of the transmission of light' was accepted decades before (and decades after) the non-common-sensical nature of the transmission of light would come to be understood. Or maybe they were overlooked as the irreversible mediated interactions at the submicroscopic level of our reality, leading ultimately to entropy, but ignored. Or trivialized as 'tired light' when light is forward scattered by high temperature plasma to produce a Doppler-like redshift. Or again when 'point' charges are associated with tangible electrons and protons with measurable cross sections.

It is typically when we are learning a discipline that the decisions made in a derivation are considered. The professor explains rationale for the decision that was made, but the adept student asks about the rationale for an alternative that may at the time have seemed irrational. That is why it has always been the young who have come up with the new theories. It isn't because they are young, it is because they have the audacity to challenge what they have been told to believe. The learning process is arduous and as 'one traveler', by the time one has learned the discipline and become engaged in its application – and thereby its propagation – one of necessity forgets about having anticipated other 'paths'. We may have briefly persisted in exploring their ramifications until we supposed them to have been refuted. Thus, we proceed merrily down our path.

While separately studying classical electricity and gravitation theory, it must have occurred to vast numbers of freshman physics students that gravitation might just be a tiny residue of the electric force between the constituents of matter. The classical theories are that close. There are, of course, many reasons why this line of reasoning is considered a naive dead end; these reasons become apparent as one's familiarity and complicity with the disciplines of physics deepens. Coulomb's theory has morphed into quantum mechanics with probabilistic issues concerning where the single 'point' charged particle 'is' and Newton's theory of gravitation has subsequently been mapped onto geometrical properties of spacetime. These were just myths once too, albeit now well established.

But myths associated with previous intuitions don't just dissolve into a sea of sophisticated verbiage. One must still see problems with currently accepted myths beyond all the hand waving about wave functions and space warping. The similarities between electricity and gravitation, electric charge and mass embodied in the same fundamental particles persist despite the continually increasing differences in presentations. But what problems with existing theoretical treatment of electrostatics and gravitation could require such drastic modification involving a merger of the two now disparate theories with ramifications to other branches of physics?

As such persistent epiphanies go, one day (or maybe in the middle of the night) they reoccur and reasons for having rejected the intuitive notions don't seem as compelling as they had. Questions persist concerning presumptions of 'point' charge singularities and action-at-a-distance. Non reified 'tendencies' of fields without substance and suppositions concerning physical force just being the way one looks at spacetime are inadequate to dispel doubts. *Everyone* has problems with singularities, action-at-a-distance, and where in the hell does mass fit in? However one's doubts are phrased; those who don't have them, just don't understand the issues. So, the conversation of alternative conjectures must go on. While there are unanswered questions, one cannot be satisfied. One's incredulity regarding so commonly accepted antinomies must not waver if we are to uphold the scientific tradition. Intuition is the precursor of scientific discovery. It must be challenged but not denied prior to adequate refutation. One must occasionally review why one acquiesced to one's notion having been refuted. Maybe it was our defense that was inadequate, not the intuition.

Existing theory is vociferously defended – try challenging it and you'll see. Take Penrose's defense of Lorentz contraction after verifying that it could never be observed. Look at the adoption of Einstein's admitted greatest error as apology for unobserved dark matter. Straight forward reasoning that convinced us of the legitimacy of a theory is contorted by forcing it to fit additional observations. But no one seems to go back to the last Y in the road to see whether an earlier intuition is now more appealing.