Letter to the Editor

Commentary on Nayernouri's "Sense and Nonsense"

Dear Editor,

The article by Nayernouri compares different visions of the world, categorized into "scientific, evidence-based medicine" (SEBM) and "traditional Iranian medicine" (TIM). In particular he traces out the histories of these visions, while attempting to show the greater strength of SEBM through its explanatory power and empirical successes. While I may agree with the result, there are significant principles and practices of SEBM that I believe are worth clarifying. SEBM is neither as "scientific" as its adherents would suppose, nor as effective as would or could be desired.

Nayernouri states that "science and technology have increased our knowledge of the world beyond the imagination of those prior scientific discoveries. No educated and intelligent person would see the world the same way as our predecessors did…" While a type of knowledge of the world has been increased, it is not at all what had been hoped for by Galileo and the founders of modern Science. They envisioned the world as a machine, or a "macro-cosmos," whilst Man a "micro-cosmos." This common sense mechanical philosophy, with matter interacting by "contact," was reasonable for its time. The Galileans initially believed that logic and experimentation would lead to precise and total knowledge.

Such "imagination" was severely constrained by none other than the great hero of Science, Newton, whose theory of gravitational force "acting at a distance," while immensely successful, was in his own words so "great an absurdity that I believe no Man who has in philosophical matters a competent faculty of thinking can ever fall into it." Effectively, the common sense notion of mechanization was destroyed, and has never been resurrected since, only replaced, by as Leibniz described "occult qualities."

Thus, while we acknowledge the progress of Science and technology, we should also realize the "absurdities" upon which it rests, and the subsequent "absurdities" which have followed – which seemingly must be there for our grand theories to work, e.g. "dark matter." Deep understanding and exact results diminish quickly once we enquire into the nature of structures beyond a few atoms. To a degree, "understanding," while desirable, has not been required for progress.

Nayernouri ascends into the domain of Medicine, wherein the concepts "placebo" and "clinical trials" are touted as premier representations of SEBM compared to authority-based methodologies of TIM: evidence-based medicine (EBM) compared to anecdote. Anecdote is in fact a type of evidence: non-formalized, "subjective," and thus while "non-scientific," does not imply non-effective. EBM in the form of placebo-controlled, and randomized clinical trials may represent the strongest type of SEBM possible, but it is also a highly idealized program and thus limited. Analogous to physicists studying frictionless planes: isolating the presumed core principles and organizing the colossus of data to build simple theories of the studied phenomenon, but not necessarily "knowing" the phenomenon. Indeed most understanding in the Medical domain is one of correlation studies; causal studies are left to future enquiry, or ignored.

Such EBM data in principle has nothing to say about the "real" patient at the bedside, only patients "similar to," and with significant qualifications, e.g. exclusion and inclusion criteria. The skilled practitioner is left to sort through the "reality" in some fashion, extrapolating from anecdote, armored with EBM. While this is method effective, it is not as "scientific" as SEBM would suppose.

EBM algorithms "powerful" enough to capture the clinical picture, from surgical safety checklists to myocardial infarction protocols, have obvious proximate and individual benefits. Algorithms generally can serve to distribute power from a few highly skilled operators, .e.g. master clinicians with years of training, to lower level operators with relatively little training – "a division of labor." This transformation suggests more efficient operations (with respect to scale and outcomes), lending support to de Tocqueville's adage "the art advances, the artisan recedes." Thus, through the formalization of effective theories and procedures, the individual's autonomy is diminished – with obvious political and economic consequences.

Nayernouri comments that ideas of "naturalism" or "alternative" Medicine, while enticing, are nonetheless potentially misleading – he is correct. These concepts, and the branding generated by their adherents are propagandist, just as their counterparts "modern" and "conventional," respectively, would be. As an example, cancer is naturally occurring process, yet we may seek "modern" cures, given our agreed upon values of human life and health. Serious scientific enquiry would seek out "truism," while Medicine would concern itself with such properties as efficacy and safety, amongst others. Explanatory theories and processes, regardless of pedigree, which achieve these objectives, should be Science or Medicine, without qualification.

Nayernouri ends his article with the statement that SEBM is essentially a process, we presume through rigorous means towards disinterested ends, as opposed to "edicts issued by authorities on high." He is quite right to be critical of TIM, but should similarly be as critical SEBM, as with any structure asserting its authority. The practice of SEBM, given historical, intellectual and economical reasons is extremely hierarchal and prone to the same fallacies that plague all human institutions, secular or sacred. SEBM "authorities" seek to guide the present and the future: 1) "educating" students in acceptable methods of thinking and practice; 2) distributing grant support/funding, or professional entry (licensure and certification).

We should honor our intellectual predecessors by doing better and reaching farther – at times being heretical, or as Bertrand Russell stated "In all affairs it's a healthy thing now and then to hang a question mark on the things you have long taken for granted." It is not the fault of the Ancients that their shadows loom large upon us; rather it is our own, for standing beneath them. An honest Science and Medicine would look in all directions for optimum ways towards better theories and outcomes.

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Author's Reply

Dr. Moore has raised some salient questions, which I feel compelled to answer in some detail, but I was confused by the relevance of other points with regards to science such as the mechanistic views of some older scientific theories and the recent conundrum of "Dark Matter".

Dr. Moore is correct in stating that scientific medical practice falls far short of perfection, but he errs in imagining that I have presumed or made such a claim in my article. The essence of my article was to state that modern medicine has advanced since 1000 years ago both in its capacity to explain more reasonably the causes of diseases and the treatment of some ailments more effectively than Galenic and Traditional Iranian Medicine.

I also claimed that the fundamental premises of the four Aristotelian elements and the subsequent humours on which Galenic and Traditional Iranian medical theories are based have been shown to be erroneous and hence with the shaking of these foundations the whole edifice must collapse like a house of cards.

I insisted that if traditional remedies, some of which may be helpful, and some of these herbal remedies have formed the basis of many modern medications, are to be recommended, then the purification of their active components, the dosage and the methods of administration must be standardised. The placebo controlled, and double blind clinical trials designed to evaluate the effectiveness of new medications, however imperfect they may be (as I mentioned in my article) are the best methods available today and traditional remedies must also be tested accordingly.

I derided such practices as bloodletting for bacterial meningitis in lieu of appropriate antibiotics and the fumes of burning donkey dung for menstrual pains.

I further attempted to show through some examples from astronomy and the circulation of blood how conceptual changes and paradigm shifts that have occurred throughout the past centuries, by methods based on a rational and logical system of reasoning to explain the world of reality, a system of enquiry known as the scientific method, has shaped our world views.

In recent years, our methods of reasoning have changed so that the dictums of ancient sages are no longer regarded as gospel truths, dogmas have been relegated to historical dustbins (excluding the biased opinions of some self-appointed 'authorities') and the bombastic ravings of Paracelsus and his ilk are (and should be) regarded with disdain. The cause of syphilis is no longer believed to be due to poisonous emanations sparked by planetary conjunctions, and it is no longer treated by an oral dose of mercury.

If these statements of mine are construed to be erroneous, then I have failed in explaining my thoughts.

I must now turn to my confusion regarding Dr. Moore's statements about science. I shall start with my working definition of science before I attempt an answer to Dr. Moore's *ex cathedra* statements.

In my view, science is a method of describing objective reality within a rational system of model making be it mechanical, biological or mathematical in order to make that objective reality as comprehensible as our tentative theories allow, without recourse to supernatural or metaphysical beliefs. Within this definition, scientific concepts are models of reality based on theories which can always evolve into better and more accurate models confirmed by experimental observations; they are never final 'truths' and are never dogmatic.

Furthermore, science is an evolutionary process (I use the word in its original vernacular sense of 'unfolding' rather than its biological and Darwinian connotation) and if it has recently discovered further twists in the fabric of reality, such as 'dark matter' or 'dark energy' then bully for science. To label these properties of reality as 'occult' only reflects the public misunderstanding of novel facets of the cosmos that science discloses.

The mechanistic world view that Dr. Moore refers to was probably first systematised by Aristotle and later applied by Ptolemy to the movements of heavenly bodies, predates Galileo by millennia, although Galileo may have been the first to attempt an experimental demonstration of such processes and this mechanical branch of physics culminated in Newton's laws. To label the forces of nature that science has disclosed and by which we live, including gravity and electromagnetism as "occult" is a little idiosyncratic.

Newton's mechanics still holds today in our everyday calculations despite the fact that his theory of gravitation has been superseded by Einstein's theory of general relativity. Of course Einstein could not believe in "spooky action at a distance" when quantum mechanics discovered 'non-locality', but then Einstein was wrong again about the microcosm of quantum mechanics.

The *diminishing of our deep understanding*, as Dr. Moore puts it, has a reasonable explanation because most of these scientific concepts are counter- intuitive and constrained by the limitations of our mental processes and organisational potentials of our brains. The Human mental capacities were developed to deal with the pressing environmental problems posed by a hunter-gatherer mode of survival in the African savannahs within the past few million years. Our understanding of the external world of reality required interpretational capacities limited to such an existence tinted with subjective emotional pressures leading to animistic conjectures based upon intuitive reasoning. The concepts that modern science is increasingly revealing are counter-intuitive and seem strange to our limited mental capacities.

This *diminishing of understanding beyond the structure of a few atoms* posed a surprise. Particle physics and quantum mechanical theories of early twentieth century have been experimentally demonstrated in laboratories including the Large Hadron Collider at CERN. Subatomic particles and nuclear forces, including the Higgs are no longer considered as fanciful dreams of physicists. Atoms can be visualised by 'Atomic-force' microscopes, single atoms can be manipulated by lasers and several atoms can be formed into a 'Bose-Einstein' condensates. These are considered as scientific facts at present and have enhanced our understanding of reality, not diminished it. When contemplating the universe, we have been primarily concerned with its visible components, but now we are beginning to realise that not all of its matter is visible to us (dark matter) and that there are forces of which we were not aware (dark energy) accelerating the expansion of our universe. Bully for science.

I must admit that I was baffled by Dr. Moore's statement that "To a degree, 'understanding', while desirable, has not been required for progress"! Does this mean that we can progress in ignorance? That knowledge is superfluous? What sort of 'understanding' does he wish to ignore and how does he define 'progress?

I am, however, aware that in several hundred years hence, the knowledge that we possess today as well as our 'scientific methods' will be superseded by more powerful methods of enquiry and our present cherished theories and understandings will seem as primitive and absurd as those that I have scorned in this article. At present, we stand at the beginning of the road to understand and in the future "what dreams may come, must give us pause".

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