On the Principles of Locality and Local Realism

Roger Ellman

Abstract

It is impossible for a theory to be valid while neglecting the cause-and-effect mechanisms of phenomena and contradicting the principles of locality and local realism. Quantum Mechanics contradicts both principles, proudly proclaims the contradiction, and offers no cause-and-effect mechanism for the phenomena it proposes. That is nearer to pre-enlightenment superstition than to valid science.

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The principle of locality states that an object is only directly influenced by its immediate surroundings. For an action at one point to have an influence at another point, something in the space between the points must mediate the action. To exert an influence, something, such as a wave or particle, must travel through the space between the two points, to carry the influence.

Local realism is the principle that all objects must objectively have a pre-existing value of any of their measureable characteristics independent of any measurement that is made and before the measurement is made. The measurement cannot and does not create or initiate the value.

Various experiments have been conducted purporting to validate quantum mechanic's denial of "local realism" and its contention of quantum instantaneous action at a distance via "entanglement". All of these involve arcane interpretations of the actual events taking place in the experiments. None offer an explanation of how and why the contended action occurs; none offer explanation of the action's mechanism and its relation to cause and effect.

Determining Truth

Truth is that which is in agreement with reality. Quite independent of the details of any experiment or action, there are three criteria that always apply in determining the truth, in determining knowledge, which is accumulated truth: the causality, that is the mechanism involved, non-dependence on unsubstantiated assumptions, and valid relating to all other truths, to the body of validated knowledge. These operate as follows.

- Causality or mechanism is apparent from observation and experience which show that every thing and every event has a cause, and that those causes are themselves the results of precedent causes, and *ad infinitum*. Defining and comprehending the causality or mechanism operating to produce any contended or proposed truth is essential to authenticating or validating that truth.

  The candidate truth cannot be deemed valid until its causes and mechanism are analyzed back to an already substantiated operating cause upon which it effectively depends. If that is lacking then it is always possible that a candidate truth will be found not to have a valid precedent operating cause, a valid mechanism in its precedence and, therefore, itself not be valid.

- Assumptions are proposed or contended truths, proposed or contended components of knowledge, that lack sufficient proof or justification to credit them as real truths, as really in agreement with reality. Clearly that infection cannot be part of knowledge without contaminating the whole.

  It is not easy to avoid assumptions. Personal prejudices and beliefs may not be apparent to their holder, or they may be apparent but are nevertheless deemed exceptions to the requirement prohibiting unvalidated assumptions. That may be because he considers them so important or fundamental as to be beyond question.

Or it may be because he is psycho-emotionally wedded to them, dependent on them. For example, in the history of philosophy the God assumption appears abundantly, major instances being, for example, Augustine, Aquinas and Descartes.

In the sciences, hypotheses that have not [or not yet] succeeded in advancing to the state of completely determined and validated laws nevertheless tend to acquire over time the status of being treated as if completely validated and not subject to questioning. Major modern instances of this are the "Hubble Constant" and its related cosmology and the unresolvable inconsistency of Quantum Mechanics and Einstein's General Relativity's treatment of gravitation.

In addition there can also be assumptions that are so embedded in the psyche of the pursuer of knowledge that he is not even aware of their presence and influence on his thinking and research.

- Validly relating to the body of validated knowledge is fundamental to what knowledge is: accumulated truth, assembled agreement with reality, that is agreement with that which is. Overall consistency is a fundamental requirement. A component of knowledge not being so compatible would constitute a contradiction, the holding that a thing and its refutation are simultaneously valid.

Quite independent of the details of any experiment or action, these three criteria always apply in determining the truth. The contentions of quantum mechanics, lacking satisfaction of the criteria are, therefore, invalid. It would be useful for quantum mechanics researchers to pursue development of alternative theories having associated cause-and-effect mechanisms. That is accomplished in reference **[1]** and summarized in reference **[2]**.

Likewise invalid is the extension of Heisenberg uncertainty from its valid uncertainty of measurement to the contended actual physical uncertainty of the object measured.

References

[1] This paper is based on development in R. Ellman, *The Origin and Its Meaning*, The-Origin Foundation, Inc., http://www.The-Origin.org, 1997, in which there is more extensive development and the collateral issues are developed.

[2] Appendix B of the above first reference.