Commentary 01 on
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FROM SIMPLICITY TO HYPERCOMPLEXITY: THE G, Q, C FACTORS
by Varadaraja V Raman

HIERARCHICAL REALITY AND CONSCIOUSNESS

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Abstract

The ideas presented by V. V. Raman are akin to hierarchical logic and the formula suggested might reflect some important features of triads. However, the relevance of chaotic dynamics to consciousness studies seems doubtful, and the distinction of the levels of reality requires more specification.

V. V. Raman's short article presents a self-contained model which may be of value without associating it with any one of the possible interpretations. This is a formal scheme deserving careful investigation on itself; its feasibility for consciousness studies could be considered separately. Still, the both aspects will be concerned in this commentary.

The fundamental observation that classical and quantum physics refer to different levels of reality lead Raman to the assumption of multiple levels of reality, comprising both classical and quantum behavior, as well as the level of chaos. This idea is sound enough, even if some Raman's assertions may seem disputable. Thus, the distinction of classical and quantum mechanics can hardly be reduced to predictability and stochasticity. Both classical and quantum mechanics are strictly causal, and it is the kind of prediction only that differs: while classical mechanics traces the changes in the position and momentum of a body, quantum mechanics quite precisely treats the evolution of the quantum state vector, or the density matrix in an alternative approach. On either level, the basic quantities of the formalism are calculable for all times, thus being completely predictable. The difference is in the additional procedure of constructing the observables required in quantum mechanics and absent in classical mechanics. However, the necessity of such an averaging procedure cannot make quantum mechanics any more probabilistic than classical mechanics, since, for instance, cross sections get commonly extracted from intensity measurements, which is principally the same as measuring mass, or position, with the same statistical processing of the results. Probabilistic interpretations are external to quantum mechanics, and classical thermodynamics can be quite consistently developed without any reference to quantum states, as many well-known scientists of the past used to believe.

The important characterization of the levels of reality suggested by V. V. Raman is that every level of reality should be governed by its specific laws. Inversely, any qualitative differences in the observable behavior indicate the presence of different levels of hierarchy, and it is the illegal mixture of different levels that leads to apparent contradictions and paradoxality.

However, Raman's suggestion needs one important clarification: the levels of reality are governed by different laws, but they are *the levels of the same reality*. The *same* object can be treated differently, according to the chosen level of consideration, and *all* the objects combine quite different features requiring much diversity in description. Thus, one can study the quantum properties of macroscopic media, as well as the classical motion of microscopic particles; the statistical description of a gas may be well complemented by the purely thermodynamic treatment of weak nonstationarity and nonlocality, etc. That is, all the levels of reality are intrinsic to any object, but their hierarchical ordering, with the dominance of certain kinds of behavior and relative negligibility of other aspects, may only refer to the object's interaction with the subject. In other words, what the object is *for us* is determined by what we do with it. Evidently, the roots of this impregnation of the object by

subjectivity lie in the nature of any interaction, which modifies the behavior of the interacting systems so that they are not exactly like the isolated systems of that kind. Commonly, the realization of this fundamental circumstance is attributed to quantum physics – but the simplest example of two balls with and without a spring connecting them shows that the situation is quite the same in classical physics too, with only the type of constraint changing.

Chaos has become an article of fashion in the end of the XX century. The properties of chaotic behavior seem so fascinating to many scientists (and especially to philosophers) that they are tempted to attribute all the complexity observed at different levels of reality to chaos – just like the uncommonness of the quantum picture of the world lead people to attributing everything unusual to quanta several decades ago. However, the very universality of chaos speaks against its determinative role in distinguishing life or consciousness from the "coarse matter". As V. V. Raman indicates, chaotic behavior is equally typical for both biological systems and many-phase physical media like clouds etc. – consequently, it is not enough to mention chaos to specify the difference of a rabbit from a snow-flake, or Einstein from a rock intrusion. In Raman's article, the level of consciousness differs from the level of life just quantitatively, assuming that there is more chaos in the "hypercomplex" reality of human reason than in merely "complex" reality of a biological system. Such an approach raises two principal objections: first, making chaos the measure of complexity is somewhat problematic, and second, reason does not seem to be chaotic – rather, too much chaos could be intuitively attributed to the lack of reason, consciousness or will.

Chaos may have something to do with complexity, though this relation is far from having been investigated in any detail. The contraposition of chaos to classical and quantum physics seems most doubtful, since both classical and quantum systems can exhibit both chaotic and regular behavior, so that there is no contrast to stress. Rather, chaos can be considered as a specific level of description different from either functional ("deterministic") or statistical ("stochastic") description, combining the aspects of them both. These are the levels of reality (in only one of the possible dimensions) that could be associated with the factors G, Q, C introduced by V. V. Raman. In this sense, the traditional term "chaos" might be put in line with such words as "ramification", "polymodality" etc., so that the sequence "statistics" → "functionality" → "chaoticity" would form a complete triad of hierarchical logic [1].

The formula $GQ + GC + QC = k$ suggested by V. V. Raman (the constant k might be set to unity without any loss of generality) could express the structural aspect of the triad (G, Q, C), so that the weights of the possible links between the elements of the triad would be defined by the weights of the respective elements in some hierarchical structure (arising through the interaction of the system with the observer), and the constancy of the sum would reflect the integrity of the system as described by this triad. Of course, to make the formula quantitative, one would have to either define G, Q and C as dimensionless values, or make them have the same dimension sqrt([k]), or introduce a unit conversion factor somewhere in the formula (since if $[Q]=[C]=[k]/[G]$ then $[QC]=[k]^2/[G]^2$).

Recalling the cyclic unfolding of any triad, one could observe that Raman's equation might express the development of the system in the cycle $\ldots \to Q \to G \to C \to Q' \to \ldots$, with the constant k being a kind of "grow factor", which may be either universal or characteristic for a particular system.

It should be noted that Raman's formula is not the only possibility. A simpler expression $GQC=1$ would allow for exactly the same limit cases, if one takes into account that there are no zeros and infinities in Nature, and hence one may speak about very large and very small values only. This triadic formula can also be rewritten as $GQ=1/C=X$, with X being "inverse chaos" – order?

Now we can turn to the questions posed by V. V. Raman in the end of his article:

(a) "Can C be tracked by physics and chemistry?"
(b) "Is C is intrinsic or extrinsic to the system?"

If C represents a level of reality qualitatively different from G and Q (with any possible interpretations of the letters), C cannot be reduced to G and Q, as well as G or Q cannot be reduced to Q and C, or G and C, respectively. As for intrinsic and extrinsic properties of the system, there is no rigid boundary between them, and what is intrinsic in one respect may well become extrinsic in

another. This refoldability of the hierarchy is due to the nature of any development converting the external interactions of the system to its structural peculiarities.

Finally, I would like to once again question the relation between chaos and consciousness. Unlike a chaotic system, consciousness tends to smoothen fluctuations, regularize them. Yes, the goals can be arbitrary, and the will is free – but once a goal has been set, a conscious being can move towards it despite of any variations in the initial conditions or parametric noise. Raman himself noted that "an important characteristic of the human brain is its capacity for complex logical reasoning" [2]. Even considering that we can never draw a perfectly straight line, one should admit that our "lines" are straight enough in most cases when our reason has a chance to reveal itself. Raman's note that any chance occurrence may result in dramatic long range consequences in the course of one's life is not relevant here, because it is the uncontrolled passive development that is meant; as soon as the significance of an event has been realized by a conscious person, its influence on the person's life becomes far from chaotic.

One should distinguish chaotic behavior from pseudo-chaotic behavior observed in dynamic systems. Thus, no finite sequence of trials can distinguish a chaotic system from a complex ergodic system obeying the usual Lagrange dynamics. Computer simulations of chaos are in fact pseudo-chaotic due to the finite accuracy of calculations. Also, a divergent Lagrange flow can manifest the same property of amplifying small variations in the initial conditions that is often considered as a typically chaotic behavior. So, if human reasoning is observed to draw very distant conclusions from minor circumstances, it says nothing about the chaotic, deterministic, or statistical character of the process.

If we assume that there is no direct relation between consciousness and chaos, Raman's questions 7a, 7b become irrelevant to the study of consciousness. There is no need to think that free will is a property of the brain, or admit any teleology otherwise. Rather, any physical or biological system may have some relation to consciousness, and the task of science is to specify the kind of this relation. The other side of it is that no physical or biological system can represent subjectivity in full, and hence the human body may be not unique to house reason and there may be other implementations possibly of a quite different kind.

References

[1] P. B. Ivanov "Hierarchy of Logic" *http://unism.pjwb.org/arc/1997hl/hle.htm*

[2] V. V. Raman "Brain Modes, Illusions, Perception" *KJF*, Commentary 1 to Target article 3.

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