

## Scientific Status of our hypotheses

Monendra Grover

*Centre for Agricultural Bioinformatics, ICAR-Indian Agricultural Statistics Research Institute,  
Library Avenue, Pusa, New Delhi -110012, India*

Our group has published extensively on consciousness and quantum computation especially in biological systems. This paper is an exploration of the scientific status of these proposals. Listed below are the salient features of our proposals.

1. It has been proposed by us that elementary field of consciousness is infinite dimensional quantum computer, thus performs quantum computation and is all whatever is. (Grover, 2013)
2. We have also proposed that reduction in the number of dimensions of the field of consciousness gives rise to the matter and other fields (such as electromagnetic field). (Grover, 2011 a)
3. We have tried to formalize this concept by giving the term consciousness vector (Grover, 2011a).
4. The consciousness vector is given by

$$L_{QHN} = -\frac{1}{\beta} \left[ \sum_{j=1}^N \sum_{t=0}^{n-1} S_j(t) S_j(t+1) + \sum_{j \neq j'=1}^N \sum_{t=0}^{n-1} S_j(t) \alpha_{jj'}(t) S_{j'}(t) \right]$$

5. We have also proposed that the field of consciousness associated with living organisms may have greater number of dimensions than non-living matter (Grover, 2011a). (According to the theory of Pan-psychism an elementary field of consciousness is associated with every form of matter: both animate and inanimate)
6. Thus proteins may have an elementary consciousness associated with them. According to our hypotheses (see above) this is associated with quantum computation. We have calculated the maximum computational capacity of the proteins associated with abiotic stress and not associated with abiotic stress. We found that there are statistically significant differences in the two classes mentioned above. (Grover et al. 2017)

7. Since the universe originated from singularity it is possible that all the constituents of universe are entangled. Extending the same logic it can be envisaged that all the constituents of a biological cell are entangled. (Grover and Kumar 2014 a)
8. Thus wormholes may exist between different biomolecules (Grover et al. 2014)
9. This may lead to non-local communication, so non-local communication may be of wide occurrence in the cell and may be influencing the physiology of the cell. (Grover et al. 2014)
10. We propose that the interacting molecules in a living cell are databases of quantum superpositions and scan each other for biologically relevant interactions. Grover and Kumar 2014 b)
11. We propose that at a basic level when we are manipulating biological organisms, we are altering the quantum physical properties of the biological cell. Thus with sufficiently advanced technologies, altering the patterns of quantum physical properties, for example, non-local communication may result in more precisely and efficiently altered biological organisms. (Grover, 2018)
12. Since according to multiverse hypothesis these superpositions are in different universes one can envisage a network between these superpositions. (Though, there would be no physical connection between them). This network we term as Quantum Grover Network or QGN. (Grover, 2018)
13. We have postulated that the agricultural and in fact all other human activities should be such that they increase the consciousness vector of the universe (Grover, 2011b)

14. At a lower level we hypothesize that the stress tolerance leads to increase in consciousness vector of the whole biological organism and the constituent molecules such as RNA, proteins, metabolites etc. ( Grover, 2011 b)

A very frequently asked question is whether the above hypotheses are testable and falsifiable. Let us consider our proposals one by one.

- 1. It has been proposed by us that elementary field of consciousness is infinite dimensional quantum computer, thus performs quantum computation and is all whatever is.**

The first question that arises is whether elementary field of consciousness exists. There is no experimental proof of such a field and detailed hypothesis of its properties. The only clue is the “human experience”. The second question is whether it is an infinite dimensional computer. This question cannot be answered until we are able to measure it or propose a detailed hypothesis about the scientific nature of elementary field of consciousness. So this proposal is not falsifiable within the current levels of understanding.

- 2. We have also proposed that reduction in the number of dimensions of the field of consciousness gives rise to the matter and other fields (such as electromagnetic field).**

This proposal cannot be falsified (or verified) and tested unless we learn to measure fields of consciousness and manipulate it.

- 3. We have tried to formalize this concept by giving the term consciousness vector.**  
**4. The consciousness vector is given by**

$$L_{QHN} = -\frac{1}{\beta} \left[ \zeta \sum_{j=1}^N \sum_{t=0}^{n-1} S_j(t) S_j(t+1) + \sum_{j \neq j'=1}^N \sum_{t=0}^{n-1} S_j(t) \alpha_{jj'} S_{j'}(t) \right]$$

This is not verifiable unless we are able to test the above mentioned proposals

- 5. We have also proposed that the field of consciousness associated with living organisms may have greater number of dimensions than non-living matter. (According to the theory of Panpsychism an elementary field of consciousness is associated with every form of matter: both animate and inanimate).**

This point is again dependent on measurement of fields of consciousness

- 6. Thus proteins may have an elementary consciousness associated with them. According to our hypotheses (see above) this is associated with quantum computation. We have calculated the maximum computational capacity of the proteins associated with abiotic stress and not associated with abiotic stress. We found that there are statistically significant differences in the two classes mentioned above.**

We have mathematically proved that there are statistically significant differences in the proteins associated with abiotic stress and not associated with abiotic stress.

- 7. Since the universe originated from singularity it is possible that all the constituents of universe are entangled. Extending the same logic it can be envisaged that all the constituents of a biological cell are entangled.**

This proposal is an obvious deduction. However the experimental verification of entanglement between all the constituents of universe as also in the biological cell is awaited.

- 8. Thus wormholes may exist between different molecules**

It has been proposed recently that the creation of two entangled particles leads to simultaneous creation of wormholes between them (Jensen and Karch, 2013, Sonner, 2013). Wormholes are the

“shortcuts” in space time between the two entangled particles. This may lead to non-local interactions. Also massive entanglement has been reported thus answering the questions of existence of entanglements at the level of molecules. (Ockeloen-Korppi et al. 2018).

A recent report has experimentally shown the quantum communication between three particles (Erven et al. 2014). This paves the way for multi-party communication in biological systems, as the biomolecules (at least in some of the aspects) may themselves behave in a similar fashion to elementary particles such as photons. Thus entanglement, wormholes and non-local communication can exist between biomolecules in a cell.

From our perspective the development shows that the entities in the biological cells from elementary particles to biological organisms themselves can exist in a superposition of multiple dimensions and perform extremely fast and efficient computing. Moreover this points out to the possibility of non-local communication in biological cells which may be very important in living organisms

9. **This may lead to non-local communication, so non –local communication may be of wide occurrence in the cell and may be influencing the physiology of the cell.**

It is a well-known fact that wormholes facilitate non-local communication between interacting particles. But non local communication and wormholes have not been experimentally demonstrated in biological organisms. That they influence physiology of the cell has also not been demonstrated.

10. **We propose that the interacting molecules in a living cell are databases of quantum superpositions and scan each other for biologically relevant interactions.**

The theoretical basis for such interactions has been laid in Grover et al. (2013). Though the paper mentioned interactions between DNA and RNA polymerase this interaction can be extrapolated to other interactions in the biological cell. The scientists have been able to create an entanglement of 14 particles. It is possible however to have superposition of more than 3 states (This would be closer to reality in biological systems). Till recently the record for maximum number of superposed dimensions for a pair of particles has been 11. However Krenna et al. 2014 have broken this record and have created an entangled state of 103 dimensions from just a pair of photons. Thus one of the authors of this paper has joked that the cat exists in superposition of dead and alive states in addition to 101 more states. Thus a situation closer to a biological cell where there are possibly multiple superposed states is possible.

11. **We propose that at a basic level when we are manipulating biological organisms we are altering the quantum physical properties of the biological cell. Thus with sufficiently advanced technologies, altering the patterns of quantum physical properties, for example, non-local communication may result in more precisely and efficiently altered biological organisms.**

This is not possible to test with the current level of sophistication of the technology

12. **Since according to multiverse hypothesis, these superpositions are in different universes one can envisage a network between these superpositions. (Though, there would be no physical connection between them). This network we term as Quantum Grover Network or QGN.**

This is a natural corollary of Multiverse hypothesis

13. **We have postulated that the agricultural and in fact all other human**

**activities should be such that they increase the consciousness vector of the universe.**

This again depends on the technologies to measure and manipulate consciousness vector.

**14. At a lower level we hypothesize that the stress tolerance leads to increase in consciousness vector of the whole biological organism and the constituent molecules such as RNA, proteins, metabolites etc.**

Same as 13 i.e. this again depends on the technologies to measure and manipulate consciousness vector.

So we see that our some proposals are easily obvious from already developed theories, the possibility of some have been demonstrated by experimental evidence and some are not presently falsifiable and testable with present technologies. This is entirely expected as doing Science is a messy business and sometimes there is a controversy whether the proposals/theories fall within the purview of science such as string theory/multiverse theories. There has also been a fierce debate about scientific validity of our proposals but we hope to have contributed to the cause of furthering human knowledge even if in a very small way.

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