

**Brief Note on Research Possibilities in Quantum Computing at DEI as per Gracious
Guidance received during morning field work on
3rd September 2020**

Topological graph theory, earlier known as linear graph theory, when spanned over two basis vector spaces can be used to represent systems upto 12-dimensions in our Cosmology. With two additional dimensions this sum to 14-dimensions. Such a 14-dimensional model can mathematically explain the Region of Pure Thought for the materialists or scientists and the Region of Pure Spirituality for spiritualists [Fig 1].

The approach using Meta game theory as advocated by Prof. Keith W. Hipel (University of Waterloo) along with his former student Dr. Apurva Narayan can evolve insightful scenarios. Dr. Apurva Narayan has moved to UBC as he could not be given position at Waterloo. However, if Waterloo continues to be a part of these endeavors it would be beneficial for them. Prof. Peter Roe from University of Waterloo can be requested to negotiate with Prof. Keith Hipel to bring Dr. Narayan back to University of Waterloo.

There are reports in the literature where room temperature magnetoencephalography (MEG) has been proposed. TDK, a Japanese company has commercially developed compact and highly sensitive bio-magnetic sensors, through development of applications with MR (magneto-resistive) element technology utilizing Spintronics that was cultivated through the manufacture of HDD (hard disc drive) heads. This has made it possible to sense weak bio-magnetic fields which could only be measured by using a SQUID (Superconducting Quantum Interference Device) flux meter up to now [1].

Fujiwara et al. from Tohoku University, Japan have reported MEG measurement at room temperature using tunnel magnetoresistance (TMR) with correlation factor between EEG and TMR as high as 0.7 [2]. Another research group from Nottingham University has

demonstrated room temperature MEG using optically pumped magnetometer, where 13 of these magnetometers were placed close to the scalp using a 3D printed headgear [3]. A potential area of research as per an Intel Corporation study is error correction in quantum computing using quantum algorithms. Presently, superconducting qubit systems are considered most reliable and scalable. It therefore brings an interesting possibility of exploring superconducting systems for quantum computing at room temperature.

Superconducting ability of neuron at ambient temperatures of brain was proposed in 1987 [4]. Brain is a highly interactive and nonlinear system that uses ambient thermal noise for error correction during complex computation and data transfer. In neurobiology, this is referred to as stochastic resonance. In this phenomenon, the behavior of a system in a noisy environment becomes more sensitive to an external periodic stimulus, at some optimal finite level of noise intensity. This appears somewhat counterintuitive, in that noise, which is often thought of as a nuisance, in this setting actually plays a constructive role in signal detection.

It is a well-known statistical fact that multiple observers enable more effective noise or error correction. At present confidence level of 1% is considered acceptable. But by utilizing noise effectively at room temperature, the confidence level can further be improved to 0.5% and even upto 0.01%. However, a tradeoff between high confidence level and cost of developing such systems should be kept in mind. High noise levels can result in better statistical fit and indicate a possibility of room temperature quantum computing. It is further suggested that the well-known Moore and Shannon's algorithm, which is now forgotten can be used with advantage to achieve a better statistical fit.

The above possibilities open up new avenues for research at DEI in the area of quantum computing. Therefore, efforts should be two-pronged:

1. Room temperature quantum computing (in some specified temperature range) and

2. Towards better statistical fit through multiple observers by utilizing noise for error correction.

This document is an outcome of the Guidance of Most Rev. Prof. Prem Saran Satsangi Sahab, a notable alumnus of the Banaras Hindu University, Varanasi, an internationally acclaimed scientist and technologist, and father of systems movement in India. Most Rev. Prof P S Satsangi Sahab spent about 28 years working in different academic and administrative capacities and contributed enormously to its growth [5, refer to *Science and Technology section*], [6].

References

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5. https://en.wikipedia.org/wiki/List_of_Banaras_Hindu_University_people
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Humbly submitted for Gracious Guidance.

Towards Evolutionary Art, Science, and Engineering of Consciousness (TEASE Consciousness)

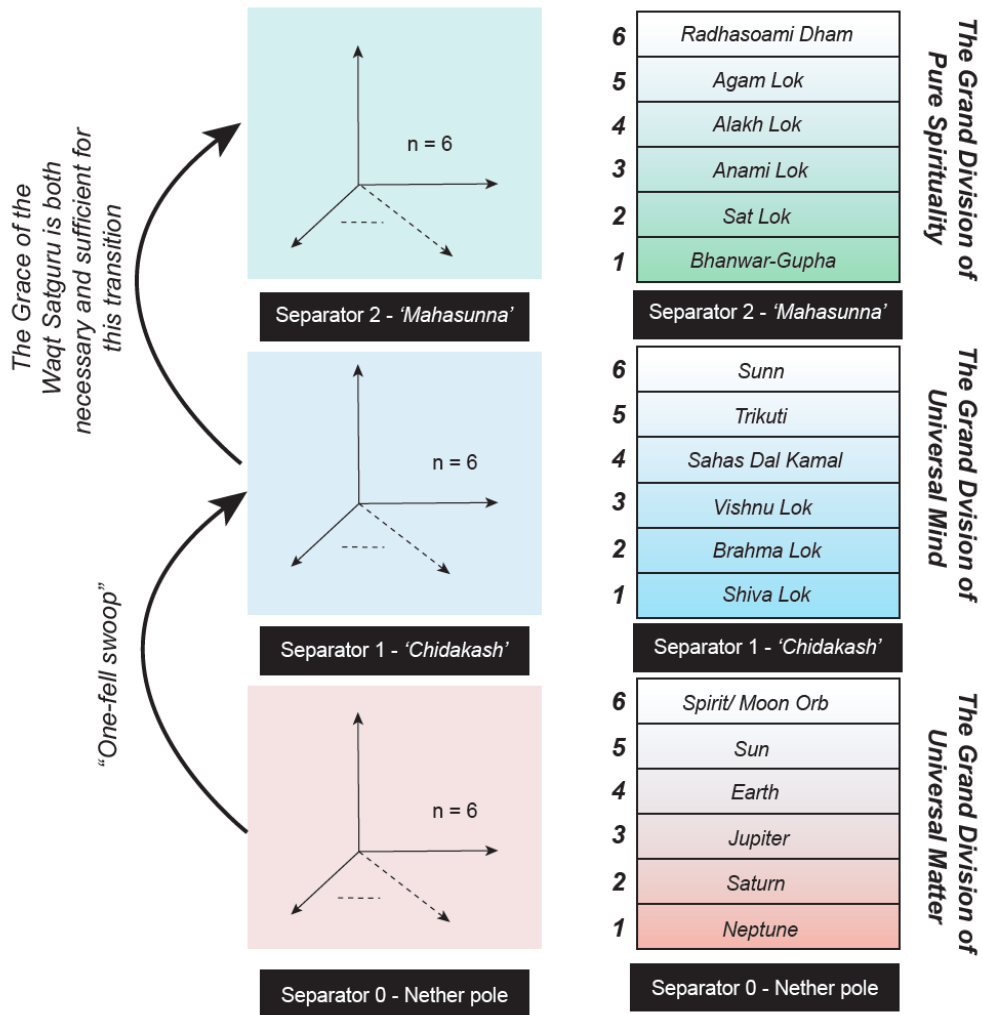


Fig 1*. The two vector spaces with 12 dimensions can span the Grand Divisions of Universal Matter and Universal Mind. But, to account for the Grand division of Pure spirituality representing the region of purest thoughts, requires mathematical model with 18-dimensions, and three separators as marked.

*(Figure-1 has been created by Dr. Apurva Ratan Murty , MIT, USA)