

# Prof. Ravi Gomatam

## Curriculum Vitae

### Education

(1998) Ph.D. in Foundations of Quantum Mechanics, Mumbai University

(1974) M.E. in Electronics Engineering, BITS, Pilani, India

(1972) B.E. in Electronics Engineering, Annamalai University, India

### Positions Held

*Director*, Institute of Semantic Information Sciences and Technology, Mumbai ([www.insist.ac.in](http://www.insist.ac.in)), 2008-current

*Visiting Professor*, Indian Council of Philosophical Research (ICPR), New Delhi, 2016-2017

*Director*, Bhaktivedanta Institute, Berkeley & Mumbai ([www.bvinst.edu](http://www.bvinst.edu)), 1997-current

*Adjunct Professor*, Birla Institute of Technology and Sciences (BITS), Pilani, India, 1997-2007

*Professor and Ph.D. Guide*, University of Mumbai, 2015-Present

### Career Arc

After Masters, moved to USA, worked with many fortune-500 companies in Detroit, in the areas of operating system design, data communications and very large data base design.

Returned to academics, obtained Ph. D. in Philosophy, foundations of quantum mechanics, from University of Mumbai.

Over two decades of experience in research, post-graduate level teaching, and guiding M.S./Ph. D. dissertations.

### Pioneering work in three different fields of science

Macroscopic Quantum Mechanics

Semantic Information Sciences and Technology (SIST)

Consciousness Studies

## Macroscopic Quantum Mechanics (MQM)

Developing a quantum theory of the macroscopic regime logically independent of current microscopic quantum mechanics (mQM).

A Nobel Laureate in quantum physics has remarked regarding his approach: "We can get out of the confusions in QM with this approach. Perhaps, **this is how we should be doing science.**"

His work in Macroscopic Quantum Mechanics (MQM) has already been cited in wide ranging fields from control engineering, neuroscience, ecology and marketing theory.

Two of his papers have been part of curriculum at Masters level in courses at Brown University and University of Connecticut.

## Semantic Information Science and Technology (SIST)

Pioneering the new field of Semantic Information Sciences & Technology. It is based on the idea of Objective Semantic Information, a new concept of matter based on his MQM.

The Institute of Semantic Information Sciences is affiliated to University of Mumbai for awarding M.A. (by research) and Ph. D. degrees in Philosophy of Science based on SIST.

A 4-year B. Tech is ready in SIST. Looking for collaboration with a good technological University.

SIST will be applicable across all fields of sciences & technology.

## Consciousness Studies

Organized the *First International Conference on the Study of Consciousness within Science* in 1990 in San Francisco. Speakers were who's who of Consciousness researchers including two Nobel Laureates – George Wald and John Eccles.

Published and reviewed papers of Journal of Consciousness Studies among others.

Conceived and designed world's first M.S/Ph.D. program in Consciousness Studies in collaboration with Birla Institute of Technology & Science (BITS), Pilani in 1997 in Mumbai. Inaugurated by Prof. Charles Townes, Nobel Laureate.

Alumni have gone to study in leading universities like Harvard, Leeds and Utrecht.

Developed his own unique approach to Consciousness Studies as a scientific study of *experience independent of consciousness*, by treating *brain as a single system*, a phenomenal whole via his Macroscopic Quantum Mechanics (MQM).

## Current Research Interests

Complex analysis; Macroscopic Quantum mechanics; Semantic search engine; Quantum Computing; Foundations of Chemistry; Entropy and information; Biology and information; History and Philosophy of Science; Vedic Bhaghavata Sankhya concepts of matter.

## Visiting Scholar Positions

University of Pretoria, South Africa, Department of Mathematics (2001)

University, New Orleans, Department of Philosophy (2001)

## Wikipedia Entry

[http://en.wikipedia.org/wiki/Gomatam\\_Ravi](http://en.wikipedia.org/wiki/Gomatam_Ravi)

## Reviewer of Journals

Synthese

Journal of Consciousness Studies

Proceedings of National Academy of Sciences, India Section A (Physical Sciences)

## Selected Research Papers

1. Gomatam, R. (2023), *On the Indivisibility of the Atom—Ancient Bhagavata Sankhya and Modern Quantum Theory*, “The 16<sup>th</sup> London Ancient Science Conference 2023”, University College London, Science and Technology Studies Department, February 15-17.
2. Anderson, G. A.; Behera, R. N.; Gomatam, R. (2022), *Evidence for an N-Halohistidyl Intermediate in the Catalytic Cycle of Vanadium Chloroperoxidase (VCPO) and an Artificial Enzyme Derived from VCPO: A Computational Investigation*, *Journal of Computational Biophysics and Chemistry*, **21**(3): pp. 299-311, doi.org/10.1142/S2737416521400020.
3. Gomatam, R. (2020), *On the Necessity of God to Science*, “Science, Religion and Big Questions”, Learning about Science and Religion (LASAR) Research Centre, Department of Education, University of Oxford, June 23.
4. Anderson, G. A.; Behera, R. N.; Gomatam, R., (2020), *Calculation of higher protonation states and of a new resting state for vanadium chloroperoxidase using QM/MM, with an Atom-in-Molecules analysis*, *Journal of Molecular Graphics and Modelling*, **99**, 107624.
5. Gomatam, R. (2019), *Einstein versus Bohr—Open versus Closed Epistemologies?*, “Open Epistemologies” Conference, University of Portugal, Lisbon, September 20-21.
6. Gomatam, R. (2019), *Biology, Information and Macroscopic Quantum Mechanics*, Second Meeting of Philosophy in Biology and Medicine, University of Bordeaux, France Oct 14-15.

7. Gomatam, R. (2018), *Complementarities beyond Bohr's*, International Congress of the History of Philosophy of Science (HOPOS), Groningen, Netherlands, July 9-12.
8. Gomatam, R. (2018), *Emergence, Experience and Quantum Physics – A New View*, Accepted for presentation at the Spring Conference of the German Physical Society, Berlin, March 11-16.
9. Gomatam, R. (2017), *Quantum Mechanics and Experience*, 10th Principia International Symposium, Florianópolis, Brazil, August 13-17.
10. Gomatam, R. (2017), *The Central Dogma, Quantum Theory and Objective Semantic Information*, Annual Meeting of the International Society for History, Philosophy and Social Studies of Biology (ISHPSSB), Sao Paulo, Brazil, July 16-21.
11. Gomatam, R. (2017), *Is Physics Truly Empirical, Currently?* Spring Meeting of the German Physical Society, Bremen, March 13-17.
12. Anderson, G. A., Behera, R. N., Gomatam, R. (2016), *A Theoretical Approach to Engineering a New Enzyme*, Journal of Physics: 738 (2016) 012013.
13. Gomatam, R. (2016), *Toward Relational Reality*, in Ghose, P. (Ed.), *Einstein, Tagore and the Nature of Reality*, Routledge: London, pp. 86-105.
14. Gomatam, R. (2015), *Objective Semantic Information and Quantum Local Causality*, Causality in a Quantum World Conference, August 16-21. Conference part of the project, Causal Power of Information in a Quantum World, University of Queensland.
15. Gomatam, R. (2015), *Toward Avoiding Nonlocality (and Locality) in Quantum Physics*, Proceedings of the Pacific Division of the American Association for the Advancement of Science, Vol 34 (1), June 14-17, p. 145.
16. Gomatam, R. (2015), *A Modern, Scientific Ontological Argument for the existence of God*, Proceedings of the Pacific Division of the American Association for the Advancement of Science, Vol 34 (1), June 14-17.
17. Gomatam, R. (2014), *Toward Placing the Concept of Chemical Element on a New Quantum Footing*, International Society for the Philosophy of Chemistry, July 7-9, London.
18. Gomatam, R. (2014), *Tandem Realism—Physics and Commonsense*, unpublished manuscript.
19. Gomatam, R. (2013), *A Critique of the Central Dogma of Molecular Biology*, Chapter 9, Biology and Information, Kanwaljeet Kaur, M.S. Dissertation, Bhaktivedanta Institute.
20. Gomatam, R. (2012), *A Quantum Model of Human Perception*, Biologically Inspired System Science Conference, March 1-3, IIT, Jodhpur, India.
21. Gomatam, R. (2012), *How Do Classical and Quantum Probabilities Differ?* in Khrennikov, A. (Ed.), *Foundations of Probability and Physics-6*, American Institute of Physics, pp. 105-110.
22. Gomatam, R. (2010), *Macroscopic Quantum Mechanics and System of Systems Design Approach*, Indo-US Workshop on Systems Engineering, IIT Kanpur, Oct. 26-28.
23. Gomatam, R. (2009), *Quantum Theory, the Chinese Room Argument and the Symbol Grounding Problem*, in Bruza, P. et al. (Eds.), *Lecture Notes in Computer Science*, Volume 5494, pp. 174-183, Springer.

“This paper contains the germ of an important idea, namely that the ontology underlying the science needs or exploit quantum mechanics in a way that allows basic entities to be signs/symbols that are representations of meanings to be manipulated in the way that certain

shapes are thought to be manipulated in the classical physics conception of reality.” — Prof Henry Stapp

24. Gomatam, R. (2008), Quantum Realism and Haecceity, *in* Ghose, P. (Ed.), *HSPCIC Vol. XII: Levels of Reality, Part 5: Materialism and Immaterialism in India and the West: Varying Vistas*, CSC, New Delhi, pp. 853-872.

25. Gomatam, R. (2007), *Niels Bohr's Interpretation and the Copenhagen Interpretation—Are the two incompatible?* *Philosophy of Science*, December, **74**(5), pp. 736-748.

Paper part of required reading in PHIL1620, Philosophy of Quantum Mechanics, taught by Douglas Kutach at Dept of Philosophy, Brown University (Spring 2010). Students submitted a 2500-word assignment on this paper.

26. Gomatam, R. (2005), Popper's Propensity Interpretation and Heisenberg's Potentia Interpretation—A Comparative Assessment, *in* Chattopadhyaya, D. P. and Sengupta, P. (Eds.), *HSPCIC: A Historical Perspective Of The Evolution Of Ideas In Science, Vol. XIII, Part 6, Probabilities, Propensity and Corroboration*, CSC: New Delhi, pp. 301-312.

“Gomatam has proposed a new approach according to which quantum theory ought to use the terms statistics' or probability' to refer only to the occurrence of observable events and altogether renounce the notion of probabilities when talking about quantum ontological states.” — Prof. B.V. Sreekantan in *Current Science*, Journal of Indian Academy of Sciences, 2010

27. Gomatam, R. (2005), *Do Hodgson's propositions uniquely characterize free will?*, Invited commentary on a target paper, "A Plain Person's View of Free Will" by David Hodgson, *Journal of Consciousness Studies*, **12**(1), pp. 32-40, Imprint Academic: UK.

28. Gomatam, R. (2004), Physics and Common Sense--Relearning the Connections in the Light of Quantum Theory, *in* Chattopadhyaya, D.P. & Sen Gupta, A.K. (Eds.), *HSPCIC, Vol. XI, Part I: Philosophical Consciousness and Scientific Knowledge*, CSC: New Delhi, pp. 179-207.

“I read your 2004 paper published from Indian Council of Philosophical Research, on quantum physics, philosophy and common sense. Excellent - well written, clear, incisive, and original. It is a fine paper.” — Prof. D. Shapere

29. Gomatam, R. (2004), *Quantum Theory and Experimental Praxis—Shall the twain ever meet?*, Canadian Society for the History of Philosophy of Science (CSHPS), Winnipeg, Canada, May 30.

30. Gomatam, R. (2004), *Complementarity—Did Bohr miss the boat?*, 5th International History of Philosophy of Science (HOPOS) Conference, San Francisco, June 24-27.

31. Gomatam, R. (2003), *Against Position*, Annual meeting of the Canadian Society for the History of Philosophy of Science, Halifax, Canada, May.

32. Gomatam, R. (2003), *On Going past the Statistical Interpretation*, paper submitted to the international conference on “Quantum Theory: Reconsiderations of Foundations-2”, June, Vaxjo University, Sweden

33. Gomatam, R. (2002), *What is Niels Bohr's Interpretation?* Annual meeting of the Canadian Society for the History and Philosophy of Science (CSHPS), Toronto, May 26-27.

34. Gomatam, R. (2002), *Einstein's Critique of Quantum Theory—A Reassessment*, Fourth Biennial Congress of History of Philosophy of Science (HOPOS), Concordia University, Montreal, Canada, July 23-25.

35. Gomatam, R. (1999), *Quantum Theory and Observation Problem*, *Journal of Consciousness Studies*, **6** (11-12), 1999, pp. 173-190.

“Issue 2 is the observation problem so labeled by Gomatam and implicit in deliberations of Bohr, Einstein, Bell and others: to identify a quantum-compatible nonclassical conception of everyday objects, one consonant with the principle of superposition.” — Turvey, Michael T. (2015). *Quantum-Like Issues at Nature's Ecological Scale (the Scale of Organisms and Their Environments)*. *Mind and Matter*. 13 (1), pp. 7-44.

36. Gomatam, R. (1999), *Quantum Information*, paper presented at the conference on Quantum Approaches to Consciousness, July 28-August 1, Northern Arizona University, Flagstaff, Arizona, USA.

“This paper shows, by some nice arguments, that the proper way to think of quantum mechanics is in terms of relationships. This is a new way of thinking. It may be that this is how we should be doing science.” — Prof. Brian Josephson

37. Gomatam, R. (1998), *Toward a Consciousness-Based, Realist Interpretation of Quantum Theory—Integrating Bohr and Einstein*, Ph.D. Dissertation, Department of Philosophy, Bombay University, India.
38. Gomatam, R. (1992), *Quantum Mechanics and Consciousness: Toward a Dual-Observer Theory of Measurement*, American Philosophical Association (APA), Eastern Division Louisville, Kentucky, USA.
39. Gomatam, R. (1992), *Local Realism or Object Realism*, poster presentation, Waves and Particles in Light and Matter: Louis de Broglie 100th Anniversary Workshop, September 24-30, Trani, Italy.
40. Gomatam, R. (1991), *Quantum Mechanics and Reality*, paper presented at the conference of American Philosophical Association (APA), Central Division; Group session: Knowledge and Reality.
41. Gomatam, R. (1990), *Quantum Mechanics and Consciousness*, paper presented at the Annual Meeting of the American Philosophical Association – Western Division, Louisville, KY; Group session on Indian Philosophy.
42. Gomatam, R. (1987), *Real and Artificial Intelligence: Toward a hierarchical model of consciousness, intelligence, mind and body*, Bhaktivedanta Institute.

## Other Publications

- Guest editor, *CSI Communications*, monthly magazine of the Computer Science of India, Dec. 2005.
- This was a special issue, brought out on the Centennial of Einstein’s *Annus Mirabilis* (1905), and was the med Physics, Philosophy and Information Technology. Besides getting many distinguished authors to contribute to the special volume, Gomatam wrote the guest editorial *Physics, Philosophy and IT* as well as a special article *Quantum Physics and Philosophy*.

## Letters

1. Gomatam, R. (2006), Letter to the Editor, *Physics Today*, April 2006, 59 (4), pp.10-12; On Nobel Laureate Steven Weinberg’s article, *Einstein’s Mistakes*, *Physics Today* October, 2005.
2. Steven Weinberg’s response to Gomatam, *Physics Today*, April 2006, 59 (4), p. 15.

## Book Review

- *Quantum Dialogue: The Making of a Revolution (Science and Its Conceptual Foundations series*, Mara Beller, University of Chicago Press 1999, *Philosophy in Review*, **20** (6), December 2000, pp. 390-2.

## Scientific Citations

Prof. Gomatam's work has been cited in books and papers in a spectrum of fields such as neuroscience, artificial intelligence, control systems engineering, quantum chemistry, mathematics, computer science, ecology and marketing theory.

### A. In textbooks, Ph.D. theses and published papers

1. Turvey, Michael T. (2015). *Quantum-Like Issues at Nature's Ecological Scale (the Scale of Organisms and Their Environments)*. *Mind and Matter*. 13 (1), pp. 7-44.
2. Prinz, Wolfgang; Beisert, Miriam; Herwig, Arvid (2013). *Action Science: Foundations of an Emerging Discipline*. Cambridge, Massachusetts; London, England: MIT Press. p. 160.
3. Zizzi, P., *From Quantum Meta language to the Logic of Qubits*, Ph.D. dissertation, School of Mathematical Sciences, University of Padua, 2011.
4. Nani, Andrea [School of Psychology, University of Turin, Italy] and Cavanna, Andrea E. [Dept. of Neuropsychiatry, University of Birmingham, UK], Brain, Consciousness and Causality, *Journal of Cosmology*, 2011, Vol. 14.
5. Hunt, Shelby D. [Marketing, Michigan State University], *Marketing Theory: Foundations, Controversy, Strategy, Resource-Advantage Theory*, 2010.
6. Fernandes, F.M.S.S. [Department of Chemistry and Biochemistry, University of Lisbon, Portugal], The Interpretation of Quantum Mechanics, in Redinha, J. S., da Providencia, J., Varandas, A.J.C.(Eds), *Quantal Aspects in Chemistry and Physics*, 2009, pp. 45-78.
7. Ghose, Partha [Dept. of Physics, Bose Institute, Calcutta], *The General Mystery of Quantum Mechanics*, 2009.
8. Pardalos, Panos M. [Industrial and Systems Engineering, University of Florida], Yatsenko, Vitaliy [Institute of Space Research NASU-NSAU, Ukraine], *Optimization and control of bilinear systems: theory, algorithms, and applications*, 2008.
9. Erol, Mustafa [Department of Physics Education, DokuzEylül University, Turkey], *Philosophy and Instruction of Quantum Physics*, 2008.
10. MacKinnon, Edward [California State University], *Generating Ontology: From Quantum Mechanics to Quantum Field Theory* 2005, *Phil-sci Archives*, 2467.
11. Stuckey, W.M. Causality as a Casualty of Pregeometry (2003) in *The Nature of Time: Geometry, Physics and Perception*, pp. 353–362, Proceedings of NATO Advanced Research Workshop.
12. Stuckey, W.M. [Dept of Physics, Elizabethtown], *On a Pregeometric Origin for Space time Dimensionality and Metric Structure*, 2002, NATO Funded.
13. Krishna, K. Madhava [Dept. of Electrical Engg., Indian Institute of Technology, Kanpur], Kalra, Prem K. [Dept. of Electrical Eng., Indian Institute of Technology, Kanpur, India] *Spatial understanding and*

temporal correlation for a mobile robot, *Spatial Cognition and Computation*, **2** (3), pp. 219-259, 2000.

### B. On websites

1. Stanford Encyclopedia of Philosophy: <http://plato.stanford.edu>
2. Department of Physics and Astronomy, University of Mississippi: <http://www.phy.olemiss.edu>
3. Japan Science and Technology Agency: J-Global: <http://jglobal.jst.go.jp>

### C. Review of Prof. Gomatam's papers

1. Popper's Propensity Interpretation and Heisenberg's Potential Interpretation—A Comparative Assessment, Paper reviewed in *Current Science*, **99** (9), November 2010, p.1268 by Prof. B. V. Sreekantan.

### D. Cited at online Libraries

1. SAO/NASA Astrophysics: <http://www.adsabs.harvard.edu>
2. Cornell University Library: <http://arxiv.org>
3. Dept. of Energy (USA): <http://worldwidescience.org>
4. Association for Computing Machinery: <http://dl.acm.org>
5. German National Library of Science and Technology: <https://getinfo.de>
6. Complutence University, Madrid (Established 1293): <http://www.ucm.es>
7. Ningbo digital library, China: [www.nbdl.gov.cn](http://www.nbdl.gov.cn)
8. Saratov Governmental University Library, Russia: <http://www.sgu.ru>
9. Ritsumeikan University, Japan: <http://www.ritsumei.ac.jp>

## Some Popular Science Lectures

1. University of California, Berkeley. 16 November 2011; *Quantum Reality—Why Physicists do not understand it yet?*
2. Tulane University, Louisiana. 27 September 2011; *Matter & Consciousness—How are the two related?*
3. IIT–Kanpur, India; Techkriti. 29 January 2012; *How not to connect Religion with Science?*
4. IIT–Chennai, India; Reflections Student Club. 06 March 2012; *Quantum Reality*.

## Dissertations Supervised

### Completed

1. Kaur, Kanwaljeet (2013)—*Biology and Information*, M.S. Thesis
2. Vinod, P. (2003)—*Visual Illusions: Significance of context*, M.S. Thesis



3. Saberi, R. (2003)—*The Problem of Causality in Science*, M.S. Thesis
4. Widolf, E. (2002)—*Understanding of Natural Resources: Contemporary Environmental Policy and the Polar Regions*, University of Tasmania, Hobart, Australia, Consultant supervisor

### Underway

1. Anderson, Greg—QM/MM Studies of natural and artificial enzymes, Ph. D. Thesis, BITS, Pilani.
2. Kaur, Kanwaljeet—Toward a New Approach to Biology and Information, Ph. D. Thesis, University of Mumbai.

## Contact Info

[director@insist.ac.in](mailto:director@insist.ac.in)

Juhu Road, Juhu, Mumbai, Maharashtra 400 049, India

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