

# LAW OF LOVE AND THE MATHEMATICS OF SPIRITUALITY

## PREFACE

The future of mankind, as far as we can see it today, is at once promising and perilous. Man's intellectual capacity, as reflected in the impressive advance of scientific technology to control the external world of matter and energy, promises to make his material life progressively more comfortable. But his inability to control the internal world of mind and thoughts imperil that future as violence fanned by political, economic and religious feelings flare up into ever more destructive confrontations. When Swami Chinmayananda caricatured modern man as someone with a huge head and a tiny heart, he was only pointing out to this tragic state where man's intelligence has far outpaced his wisdom.

Spirituality, and the wisdom it bestows, is sorely needed today if mankind is to avert a calamitous end to its dreams. The spiritual wisdom is readily available but its acceptance and dissemination is thwarted by some unfortunate circumstances, including the historic association of spirituality with religion. In-fighting between religions, as well as the controversies it has had with science, have by and large hurt the credibility of religions in the eyes of many thinking people. By association, it has hurt the credibility of spirituality also. Secular societies find it difficult to encourage spiritual education in fear of violating the principles of separation of state and religion. Youth trained in science often choose to avoid spirituality together with the religions they mistrust. Result is that humanity is turning a blind eye today to the prospect of peace and harmony that can be achieved by spiritual education.

This is indeed tragic considering that the association of spirituality with religion, while a historical fact, is not a logical necessity. In fact, in advancing a mathematical theory of spirituality, this book presumes that spirituality can be pursued as a science in its own right and that it can be studied and taught as any other science, without reference to any religion. Vedantic philosophy is used in the book as the foundation for the mathematical theory since it has the necessary logical rigor to make the effort successful. The essential facts about spirituality that Vedanta teaches apply to all people regardless of their religious background.

The use of mathematics has allowed modern science to gain precise insight into the workings of the material world. It has excelled time and again in bringing out the common principles that often underlie different branches of science. In the same vein, mathematics applied to spirituality can be expected to facilitate a better, more precise understanding of our spiritual nature and reveal any similarity it may have with other branches of knowledge. I believe this expectation has been realized to a degree by the ideas presented in this book. It is possible now to represent key ideas of spirituality- such as detachment, suffering, spiritual evolution, suffering and liberation- using graphs and mathematical expressions. This opens up a new approach to discuss, understand, and teach abstract spiritual concepts clearly and effectively using graphical and other mathematical representations. The theory presented here also brings out clearly a number of mathematical similarities between the spiritual realm, as seen in Vedanta, and the material world as seen through Relativity theory and Quantum Mechanics. For example, the Law of Love, which is one of the first and basic results of the theory of

spirituality in this book, appears as a mathematical twin of the space-time relationship in Relativity theory. Nevertheless, matter is not spirit; therefore the similarities noted are not an indication of the identity of the two.

The work which has culminated as this book began about ten years ago when I sought to understand in terms of modern decision theory the effect of our innate tendencies (*vasanas*) on our thoughts and actions. The resulting ideas formed the basis for the Prakriti-Ishwara Paradigm used in this book and were published in an article in the December 2000 issue of *Chinmaya Management Review*. The mathematical theory which took shape over the next five years or so was presented in various WAVES (World Association of Vedic Studies) conferences held during 2004-2008.

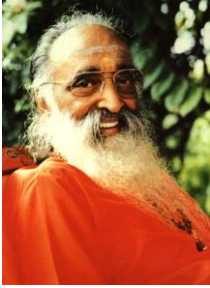
What is presented in this book is not offered as the final definitive theory of spirituality, but as the outline of a promising new field which will be hopefully enriched by contributions from more Vedantins, philosophers, mathematicians and spiritual scientists. The outcome of such a joint effort will be to firmly establish spirituality as a science that transcends all religions and which can be taught as a course in science in schools and colleges everywhere.

What the world direly needs is the Love that spiritual knowledge can sow in the hearts and minds of all people.

Alexandria, VA  
(Date)

- Raju Chidambaram

## ACKNOWLEDGEMENT



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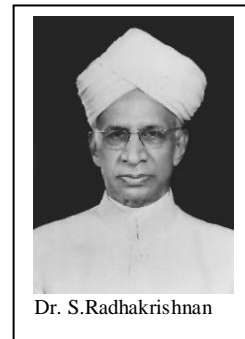
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## INTRODUCTION

You will find in this book a rather unfamiliar mix of spirituality, Vedanta and mathematics. As such the reader's first reaction may be to question what Vedanta has to do with Mathematics or how mathematical analysis can help a discussion on spirituality. While the long answer to this question is in the pages of this book itself, I would like to address these questions now as a way of introducing the subject matter of the book.

Deep within all human beings there is a longing for truth, love, happiness and peace. This dimension of our existence is separate from the physical comforts we seek from the world and is a manifestation of our spiritual nature. The spiritual needs of human beings are as real as their physical needs. Being real, it should be possible to investigate this spirituality with the same objectivity found in the sciences dealing with the physical world. Scientific methods, including mathematical analysis, that have so well succeeded in furthering our understanding of the universe of matter and energy should also help in studying spirituality. This is the rationale for my views; the inspiration for this view has come to me from two great thinkers and teachers of our time, Dr. S. Radhakrishnan and Swami Chinmayananda.

In the summer of 1961, I and my fellow graduate students in the Indian Statistical Institute, Calcutta, were sent to New Delhi to learn about the ways the various departments of the Government in India collected and utilized statistics in their work. A small group among us (including notably a Subramaniam Swamy, destined to make a prominent name for himself in Indian politics) took the opportunity of our month long presence in the capital city to seek audience with the then Prime Minister Jawaharlal Nehru and separately with Vice-President Dr. Radhakrishnan. Our requests were promptly granted, partly based no doubt on the reputation our institution and its director Prof. Mahalanobis had with Mr. Nehru and others. While our encounter with the Prime Minister was polite but brief, the one with the Vice-President at his official residence was more engaging. Seated cross-legged in an overstuffed chair and without his customary turban, the eminent philosopher appeared quite relaxed and willing to talk. He opened his remarks tauntingly with the cliché "Ah, Statistics and lies!" meant clearly as a bait, but then quickly moved to soften the blow by adding another well worn phrase "Figures do not lie, but liars do figure." To our relief, however, the discussion turned away soon from statistics and more towards philosophy.



Dr. S. Radhakrishnan

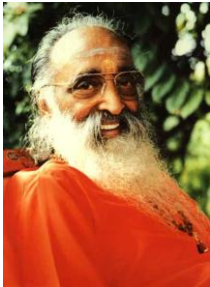
What I recall most about that evening was his response to a question I asked him: What did he have to say about the historic stand-off between Science and Religion? I expected a long answer to a difficult question, but what I got instead was a stern put-down followed by a memorable one-liner.

*"Don't tell me tall stories!"* said Dr. Radhakrishnan, as though my question was presumptuous. Then, after a brief pause, he added:

*“A little bit of science takes you away from religion—but a little bit more of it will bring you right back to it!”*

I do not remember much else the Vice President said in answer to my question, but probably that is because everything else that followed was somewhat redundant. The sharp insight behind his short answer was indeed impressive. Guruji Swami Tejomayananda, the current Head of the global Chinmaya Mission, who we had the honor of hosting once at our home, thought well enough of Dr. Radhakrishnan’s statement to quote it in his fascinating book *Hindu Culture* [1].

Dr. Radhakrishnan was a scholar renowned for his understanding of world religions, but his ideas were particularly well rooted in the Gita and Upanishads. To me his answer revealed his conviction that modern science and the Vedanta taught in the Gita and Upanishads are not in conflict and that in fact they have edged closer to each other in recent times. In making his statement, Dr. Radhakrishnan was very likely referring to the revolutionary ideas in the 20<sup>th</sup> century science, especially in Physics.



One of the most effective teachers and practitioners of Vedanta in the 20<sup>th</sup> century was Swami Chinmayananda, the founder of the world-wide Chinmaya Mission. The author is fortunate to have had the opportunity to listen to his talks on Vedanta and also to be closely associated with the Mission for over two decades. Gurudev, as he is known to many in the Mission, usually referred to Vedanta as the “subjective science” where the object of scientific enquiry is one’s own self or “the seer”. He emphasized that in its rigor of reasoning and analysis, Vedanta was no less scientific than the “material sciences” where the object of enquiry is the outside world or “the seen”. Vedanta’s theoretical constructs are logically sound and its practical inferences verifiable by experience. Swami Chinmayananda brought this out clearly by what he taught as well as by the way he lived among us.

#### *Vedanta and Mathematics*

“*Nyaaya saastra*” is a venerated system of logic used by Vedanta and other Hindu schools of philosophy as a sure guide to correct reasoning. It is appropriate to note the impact this system of logic has had on the development of modern mathematics itself. Mary Everest Boole, wife of the nineteenth century mathematician George Boole and herself a mathematician, has observed how the *nyaaya saastra* influenced her husband’s work in developing what is now known as Boolean Logic, fundamental to many branches of mathematics and computer science [2].

With its basis in logic, Vedanta’s approach to spiritual questions has a distinctively modern-day scientific air to it. It is this logical basis that makes it feasible to apply mathematical tools to understand spirituality as taught in Vedanta.

*Mathematics and The Power Of Disciplined Thinking:* Science, and the countless blessings it has brought to the material world, has demonstrated the apparently limitless potential of the human intellect to provide answers to profound questions through disciplined thinking. This success of modern science is in no small measure due to mathematics which verily embodies

the art and power of disciplined thinking. The tremendous progress in mathematical techniques (and computer technology) has made it possible for researchers in all disciplines to use mathematical models to develop a deeper understanding of the phenomena of interest to them. There are several attributes that give mathematics its power and beauty. Parsimony and precision are two such attributes. A mathematical approach demands precision in the definition and use of concepts. It encourages the use of as few concepts as necessary to model a problem, highlighting what is important as opposed to what is redundant or even irrelevant. In contrast, operational meaning of concepts used in verbal reasoning can be ambiguous and more easily misunderstood; this could lead to conclusions which are not robust, or are vague or incomplete. A second virtue of using mathematical analysis is that it forces into open all assumptions underlying an argument so that the conclusions drawn from an analysis can be understood in their proper context with all necessary caveats.

Mathematical reasoning has been made rigorous by centuries of painstakingly meticulous work by many brilliant minds. Compared to verbal reasoning, the logical rigor of mathematical analysis is clearly superior and nearly infallible. Communicating abstract ideas and arguments to others also becomes more reliable with the use of mathematical analysis. A great help in this respect is no doubt the visual appeal of graphical representation that often becomes possible with the use of mathematics. The reader will have an opportunity to assess this benefit for himself or herself from the graphs and charts used throughout the book.

Perhaps the greatest advantage of using mathematics is because of its status as the “Law of Laws”. Once a problem or phenomenon has been satisfactorily modeled using mathematical concepts in geometry, calculus, probability, etc, further analysis can proceed with the aid of the vast array of results already available to us in those fields. This is because mathematical laws are the same whether the context of study is physics or biology or economics, or, for that matter, spirituality.

Mathematics itself is abstract in the concepts and methods it uses and there is nothing worldly or material about it to suggest that it is suitable only for the material sciences. On the contrary, many eminent mathematicians have been inclined to view mathematics in wholly spiritual terms. To Srinivasan Ramanujan every proven mathematical equation was the voice of God. Thus there is no *a priori* reason to conclude that mathematics is appropriate only for material sciences; on the contrary, it may be even more appropriate for a spiritual science such as Vedanta.

### ***An Overview Of The Contents***

I do believe that the claims regarding the benefits of mathematical analysis have been vindicated in the case of spirituality through the theory and results presented in this book

The book, arranged in three parts, is meant to be as self-contained as possible so that readers not familiar with the Vedantic philosophy can also profit from it. Part I, with four chapters, provides the necessary footing in the Vedantic concepts required later. Chapter-1 discusses basic questions relating to science, religion, and spirituality. The purpose is to draw the necessary distinctions between religion and spirituality and to show that any conflict between science and religion does not extend to spirituality. On the contrary, spirituality, as systematized in Vedanta, is a science in its own right. It is the science of knowledge as opposed

to the science of matter and energy. Chapter 2 introduces the concepts of Vedanta and shows how they explain an ever changing cosmos that is actively experienced by sentient beings. The basic view regarding the experiencer, experienced, and experiences is developed leading to ideas of suffering, detachment and liberation. Knowledge acquired through life's experiences, is the essence of spiritual progress. Chapter 3 develops the important *Prakriti- Ishwara* paradigm in order to explain the nature of uncertainty found throughout creation, its function, and its implications regarding free will. The basic idea is that while the world that an individual meets is as willed by God, how it meets that world is up to the individual's free will to decide. The final Chapter of Part I presents the emerging views of neuro-cognitive sciences and how they square with the Vedantic concepts of consciousness and cognition. It is clear that science is yet to fully grasp the nature of consciousness and that Vedantic views continue to maintain their logical validity in the face of the evidence from neurosciences.

Part II consisting of five chapters develops the mathematical framework reflecting the Vedantic views described in the earlier chapters. The theory is built in a fairly straight forward manner using a few key concepts such as *mahat* (cosmic mind), *vasanas*, *vairagya* (spiritual detachment), *purushartha* (will power or self-effort), suffering, and Realization. These concepts are given a mathematical expression, and the inter-relationship among them is studied using relatively simple mathematical methods. The results of analysis conform to the conclusions of Vedantins, thus providing an important validation of the model. While the results are not new, the methods used in arriving at the results are new and provide a greater and clearer understanding of the basic processes involved in spiritual evolution. The relationship between spiritual detachment and *vasanas* is one example of the added insight gained by mathematical analysis. The graphic representation made possible by the model can be valuable in visualizing and communicating some of the abstract concepts in spirituality.

A welcome surprise of the mathematical exploration has been the sharp focus into which it has brought the many similarities shared by Vedanta and modern physics. Substitute the words "Self" for "space" and "Knowledge" for "light" and we transform results in relativity physics into teachings of Vedanta. Many physicists and philosophers have speculated for a longtime on the similarities between eastern philosophies and modern science, as the quote from Dr. Radhakrishnan suggests. We see this clearly demonstrated in Chapter 6 where several basic features of the time-space continuum and the cosmic mind space (*Mahat*) are described using identical mathematics. The similar views that science and Vedanta have regarding Free Will shown in Chapter 7 are also remarkable. The concept of time turns out to be as important for a theory of spirituality as it is for Physics. In Chapter 9 we present ideas from physics, neurosciences and Vedanta all of which point strongly to a universe which itself is timeless. It is therefore an enigma how sentient creatures can experience time in a timeless universe. Resolution of this mystery requires a drastic revision of our commonly held beliefs about reality and leads to a viewpoint which is stranger than fiction, yet in full accordance with the teachings of Vedanta.

One may mistakenly conclude from the nature of the discourse in Parts I and II of the book that Vedanta is just a set of abstract concepts and mathematical theory fit only for academic discussion. Part III of the book is devoted to show that, quite to the contrary, Vedanta is very relevant to individual and social life. Spirituality taught by Vedanta can root out ignorance and

bring joy to daily life. Much of our suffering is due to misunderstandings we have about life, the world, and ourselves. Vedanta removes these misunderstandings with convincing logic as shown in Chapter 10. Swami Chinmayananda exemplified the transformative power of Vedantic knowledge. His energy and enthusiasm were phenomenal in spite of pressures of work and health problems. The aura of joy that surrounded him all the time was infectious. He demonstrated that the hallmark of a spiritually evolved soul is the love and joy that spreads from it to brighten the world around. Spiritual knowledge is a requirement for individual happiness; it is also the cure for the many economic and social problems facing society as a whole. We discuss in Chapter 11 the power of selfless love and altruism to transform societies. All this is possible, of course, only if spiritual education is available to all people and is actively encouraged. The need for scientific education in spirituality is emphasized in the final chapter of the book, where we also look at some of the areas for further research in spirituality that the book suggests.

### ***Highlights of the Mathematical Theory Of Spirituality***

A main contribution of the book is the mathematical theory of spirituality it advances. It may be helpful to list some of the highlights of that theory as an introduction to the book.

- 1) The mathematical model is based overall on a view best expressed in modern times by Sri Ramana: While the world that a jeeva encounters moment after moment is totally under the controlling Will of *Ishwara*, the manner in which it faces that world is up to the jeeva to decide. The jeeva may meet the world in attachment to the Non-Self (*bhoga*) or established in Self (*yoga*.) As a *bhogi*, the jeeva suffers; as a *yogi*, it takes one step further towards Perfection. This choice is available to the jeeva every moment.
- 2) The Cosmic Mind space (*Mahat*) is the space in which the “*triputi*” of all possible worlds experienced, all experiencing jeevas, and all conceivable experiences exist. This space is described mathematically in polar coordinates  $(t, \theta)$  where  $t$  denotes the experienced worlds at time  $t$ , and  $\theta$  denotes a jeeva with detachment  $\theta$ .  $(t, \theta)$  together denote the experience of the jeeva at time  $t$ . An interesting feature of this representation is that only one-quarter of the *Mahat* space (namely the first quadrant) is required to denote all possible worlds and experiences; the other three quadrants remain undefined, beyond anything objectively experienced. This is curiously reminiscent of the famous opening mantras of *Purusha Sooktha*.
- 3) The analysis reveals an unexpected and unexplained similarity between the *Mahat* space and the four dimensional time-space continuum of Relativity Theory. Past, present, and future co-exist in the time-space continuum, according to Einstein. *Mahat* also is beyond time. That is, time is in Cosmic Mind, but Cosmic Mind is not in time. Further, in parallel with the well known relationship between (ordinary) space and time in special relativity theory, there is a mathematically identical relationship between a jeeva’s state of spiritual evolution and its worldly suffering. This relationship, demonstrated using Minkowski’s metric, can be stated in words thus: “As a *jeeva* gains more and more in Universal, Unconditional Love and Understanding, it suffers less and less in the world”. This statement is a first and immediate result of the model and hence it may qualify as the “fundamental result of mathematical spirituality”,

especially since Love is acknowledged as a supreme, necessary virtue in all major religions.

- 4)  $\theta = 0$  characterizes a jeeva fully attached to the world. Increasing value of  $\theta$  denotes spiritual progress. God-Realization occurs when  $\theta$  reaches the maximum possible value, namely  $\pi/2$ . A result that is likely to be gratifying to mathematicians is the relevance of the Euler's equation, namely  $e^{i\pi} + 1 = 0$ , to the model in describing Realization. This equation - acknowledged by many as the most famous and beautiful of all equations in higher mathematics- has held a mystical significance for mathematicians since its discovery nearly 250 years ago.
- 5) The *jeeva* can choose to identify with the Self or to identify with the Non-Self at any time, according to Sri Ramana. A probabilistic equivalent of the model is derived to reflect this freedom which gives a new interpretation for the variable  $\theta(t)$ , the spiritual detachment at time  $t$ . The *a priori* probability that the *jeeva* will identify with the Self is  $\sin^2\theta(t)$ , implying higher probability of identifying with Self with higher detachment  $\theta(t)$ . Upon Realization, the probability of identifying with Self becomes 1, as one would expect. *Jeevas* with low detachment are more likely to identify with the Non-Self if left to their usual nature. But even such a worldly *Jeeva* can identify at any time with the Self provided its will power is strong enough to overcome the pull of its lowly *vasanas*.
- 6) A theory of *vasanas* has been proposed which integrates well with the overall mathematical model of detachment and spiritual evolution. *Vasanas* of a *jeeva* at time  $t$  are represented as a function  $V(x,t)$  indicating the energy with which the *jeeva*'s mind responds to *vasana* stimulus  $x$ . The variable  $x$  ranges from 0 to 1 with value 0 corresponding to lowest *tamasic* *vasanas* (e.g. survival instincts associated with the *muladhara* in *Kundalini Yoga*) and the value  $x=1$  corresponding to the highest *satwa* (i.e. the "*tatwa*" associated with *sahasrara* and Realization). Based on this representation, the mathematical relationship between spiritual detachment  $\theta(t)$  and the *vasana* function  $V(x,t)$  has been derived. In essence, it relates  $\theta(t)$  to the mean value of  $V(x,t)$ . More *satwic* the mind, higher is its detachment.
- 7) Mathematically speaking, spiritual *sadhana* (practice) involves the re-shaping of the *vasana* function  $V(x,t)$  so that its mean value gets increasingly closer to 1. From this perspective, questions such as limits to spiritual evolution and the nature of Realization are discussed leading to observations consistent with Vedantic teachings.
- 8) The model permits incorporation of the Advaitic views on how *jeevas* derive happiness (or its opposite) by contact with objects of the world. This leads to a final result showing how the "suffering" of *jeeva* at any time can be expressed as the product of three factors: 1) the level of alertness of the *jeeva*'s mind, 2) the degree to which the *jeeva* accepts good and bad outcomes with equanimity, and 3) its spiritual detachment. The *karma*, *bhakti*, and *jnana* yoga recipes for reducing suffering are reflected in this result.

The above theory is a mathematical representation of the Vedantic theory of spirituality. I am careful not to claim that it is the only such representation possible; other mathematicians and Vedantins may propose better models after reviewing the book.

The reliability of the conclusions drawn from a mathematical model is largely determined by the “goodness of fit” or how well the model fits the phenomenon studied. In physical science, one can validate a theory by comparing its predictions with the observed results in the laboratory. This technique however may not be feasible for a theory of spirituality. The best one can probably do in this case is to stay consciously consistent with the spiritual insights gleaned from teachers, scriptures, and the morals of mythological (*paauranic*) stories. In other words, we should judge a mathematical theory of spirituality by how consistent it is with the teachings already available in spiritual literature. There should be no expectation that mathematics will lead to discovery of new spiritual truths hitherto unknown in Vedanta. Vedanta is a complete theory of spirituality backed by the thoughts and experiences of seers over many centuries and it is doubtful there are any new spiritual truths unknown to them.

A book of this nature cannot avoid using Sanskrit terms for the many Vedantic concepts. I have tried to explain each such term wherever they occur first. The Glossary at the end of the book lists these terms alphabetically and can serve as a useful reference for those not familiar with Vedanta. Sanskrit terms are usually, but not always, in italics; well known terms such as yoga as well as oft-repeated terms such as Brahman, Atman, Ishwara, and Jeeva are not italicized.

The mathematics needed to follow discussions in Part II is roughly at the high school AP or college entrance level with a basic knowledge of calculus and probabilities. Parts I and III of the book do not require any mathematics whatsoever; readers not comfortable with mathematics can read these chapters for the understanding it provides about the spiritual science of Vedanta.