CHAPTER 1: INTRODUCTION

Vedic literature contains statements that have been tested and verified by methods of modern science. Yoga practices from Shad darshanas have been profoundly verified experimentally in both physiological studies and medical trials. Adishankara's profound statements from his commentaries and expressions on *Advaita* Vedanta have been shown to provide a profound basis for understanding consciousness in terms of modern science. Ayurveda passed thorough scientific scrutiny and testing; thousands of studies have now been published and is shown to agree with deep understanding of biology in both theory and experiment. The limbs of the *Veda*, the *Vedangas*, have also been tested. The first of six *Vedangas*, Shiksha, has been shown to provide deep insights into the nature of experience, and the foundation for a new approach to cognitive science. The last of the Vedangas, Jyotisha, the Vedic system of sidereal astrology, has also been thoroughly tested. In recent years, the Vedic sciences have proved a rich source of testable scientific conjectures. Many Yoga practices have been empirically tested, and shown to yield results stated in Yoga texts (Shearer, 2010; Tekur et al., 2012), e.g. sitting in lotus posture increases values of prana (Muktibodhananda, 1985); verified using electro-acupuncture diagnostic tools (Ghosh et al., 2017). Such results vindicate the wisdom of the ancient rishis. Reasons for their validity have also been elucidated (Rameshrao & Hankey, 2019**)**.

Similarly, tests have established Yoga's beneficial medical results for both physiology and psychology (Nagarathna & Nagendra, 1985). Compliance with Yoga lifestyle increases scores on quality of life (QoL) tests, (Woodyard, 2011), and reduces anxiety (Streeter et al., 2010). Purposefully developed Yoga modules improve all kinds of pathology (Naveen *et al.*, 2013; Tripathi et al., 2012). They decrease labour time and complications (Maharana et al., 2013). Practice of Transcendental Meditation, a pure form of *Dhyana*, reduces medical

expenditure in both short-term (Herron et al, 1996) and long-term practitioners (Orme-Johnson, 1987).

In certain fields, Vedic sciences' theories of systems behaviour are better than modern scientific theories. Ayurveda (Sharma, 1981; Sharma & Das, 2006), identifies properties of the physiology still unrecognized in biomedicine, e.g. the *dosha prakriti* or physiological types (Sharma & Das, 2006); and their *dosha vikriti* paths to pathology (Sharma & Das, 2006). These ideas have been empirically confirmed by using them as Scientific conjectures and testing such concepts empirically have yielded consistent results (Shilpa & Venkatesha Murthy, 2011). Appropriate lifestyles provide protection from falling sick (Datey & Hankey, 2016). Such studies show that Ayurvedic thought about human physiology and its susceptibility to disease is essentially correct. Collaboration between Ayurveda and Biomedical sciences can develop the discipline of Ayurveda integrative medicine (Shankar, 2010). Ayurvedic wisdom and expertise can now be incorporated into the canon of modern biology and medicine (Hankey, 2005).

The research reported in this thesis concerns the Vedic system of sidereal astrology, *Jyotisha* (Santhanam, 1984). It is used to generate testable scientific conjectures, despite the subject arousing intense emotions in scientists, because science has assumed that no physical mechanism to test it is possible. The Vedic sciences, in contrast, hold *Jyotisha* in high regard, considering it 'the Science of the Sciences' (Rameshrao & Hankey, 2019). In the Vedic literature, *Jyotisha* is the sixth of the Vedangas, the limbs of the Veda.

This thesis proper starts with an exposition of Jyotisha as a supreme spiritual science elucidating deep understanding of Vedic sciences of the soul. Its appellation as the 'science of sciences' in the Vedic literature is fully justified. Of primary concern to the soul is its progress on the path of *Sanatana Dharma*, expounded in terms of the four concepts of *Chaturvidha*

Purushardha, namely *Dharma – Artha – Kama – Moksha*: spiritual tendencies, ways to make gains of all kinds, probable achievements, and feasibility of attaining spiritual liberation, *Moksha*.

The *Dwadasha bhavas* of a *Jyotisha Kundali*, which represent body parts of *the Kalapurusha*, personification of the concept of Time dimension, are defined into four categories that signify *Chaturvidha Purushardha* or four goals or aims of life. This division of 12 bhavas yield a triplet for each for *Dharma, Artha, Kama*, and *Moksha*. *Out of the four Purushardha, Dharma* gets contributions from the auspicious *Trikona bhavas,* viz., for individual nature, teachers and spiritual orientation which get reflected in: *Lagna,* the 1st *bhava* for the individual, *the 5th bhava* for educational pursuit, teachers and children and the 9th *bhava* for the support a person gains from nature. Similar triplets of *bhavas* are defined for the remaining three *Purushardha. Bhavas* 2, 6 and 10 for *Artha; Bhavas* 3,7 and 11 for *Kama* and *Bhavas* 4, 8 and 12 for *Moksha*.

Variability in exponential phase growth rates of a non-pathogenic strain of E. Coli, K-12 MG 1655, cells is far smaller between growth curves with the same time of flask inoculation (TOFI), and that this small variance would grow to the overall observed variance with increasing difference between starting times. More specifically, it investigates the influence of time on the processes involved according to concept of time derived from India's traditional knowledge of Jyotisha Shastra.

The reported series of bacterial growth experiments tested and verified these experimental conjectures. They show that variability in exponential phase growth rates is far smaller between growth curves with the same TOFIs than for identical growth processes conducted over many months; further, variance gradually grows as difference between start times increases. Nothing has previously been proposed to solve the variability dilemma. These

results suggest heterogeneity depending on starting time, and represent the first step towards elucidating the Jyotisha-based solution. Chapter 2 of this thesis gives a short exposition of the fundamentals of *Jyotisha* used to interpret a given *Jyotisha Kundali.*

Jyotisha's significance lies in its ability to make predictions about the course of any process and its outcome based on its starting time. Most usually it is used to predict the main tendencies in a person's life, based on the time of their birth, *Janma*, and how to avoid or mitigate various kinds of suffering if any are predicted. *Jyotisha* expounds that starting times, whether auspicious or inauspicious, influence all processes. Now even microbiological processes and their outcomes are found to vary with quality of starting times, elucidating the dimension of time as heterogeneous.

Incorporating the relevance of the time, space and consciousness dimension embodied in *Jyotisha* astrology, a subtler dimension than those so far incorporated in modern bioscience, the present experiments offer new understanding of variances in bacterial growth that replace previous ideas.

A previous S-VYASA PhD research study (Rao et al., 2014) conducted the first rigorous tests of *Jyotisha* in a microbiology setting. The thesis and its accompanying publications (Rao et al., 2013a; Rao et al., 2013b) showed that *Jyotisha* correctly predicts outcomes of vaccine production runs based on starting time of flask inoculation (considered as Muhurta) involving microbial growth. When benefic Grahas were influencing the *Lagna Muhurta*, growth of bacteria was enhanced, while virus propagation was slowed. On the other hand, when malefic grahas were influencing the Lagna, growth of bacteria was slowed, and propagation of viruses was enhanced. As microbiologists know, output from such experiments is unpredictable; but the 3 *Grahas*, *Guru* (Jupiter), *Chandra* (Moon), and *Rahu* (the North Node) account for more than 70% of observed variance.

Jyotisha tradition (Santhanam,1984), states that eclipse effects are more malefic than the influence of *Rahu*, the moon's north node (Santhanam, 1984, chapter 9), and that one should cease all activity at such times. Dr. Ramesh Rao's research studies assessed the effects of three solar eclipses even though they did not pass through India, since these are said to exert their malefic influence on all life on earth. Comparative values of virus vaccine production on solar eclipse dates showed that their effects were indeed more than *Rahu*'s.

The hypotheses leading to these conclusions originate in, and validate, Indian traditional knowledge: starting times (can be auspicious or inauspicious) influence all processes. Outcomes of processes vary according to quality of starting times. The whole concept of time in ancient Vedic culture was different from that imposed on us today by western science. The entire structure of ancient Indian culture was aimed at going to a state where time does not affect the individual-beyond time known as *Mahakala* (Vatsayana, 1996), beyond the bite of time'. The *mahakāla* concept, central to Vedic conceptions of time, sets the structure of life and living in a different context from that of western science. Time is a variable dimension with heterogeneous nature, with different inherent effects for different people at different times. Now even microbiological processes and their outcomes are found to vary with quality of starting times.

Another class of quantitative tests of *Jyotisha* came from the Amrita Institute of Medical Sciences, Kochi, where Dr. T. Srilakshmi and her colleagues showed how *Jyotisha* birth chart conditions are associated with susceptibility to various diseases. They hypothesized that such conditions increase susceptibility to particular pathologies (Srilakshmi et al., 2011a; Srilakshmi et al., 2011b; Srilakshmi & Reddy, 2013) and conducted a series of studies in which, for example, frequency of occurrence of afflictions related to particular *grahas* are observed in patients with those pathologies. This contrasted with observed lower frequency of occurrence

in control groups**.** Statistical tests found that the probability of this occurring by chance was low. Such research validly done on retrospective data offers an excellent way to show that Jyotish astrology makes non-trivial and empirically testable predictions. These findings of birth chart analysis effectively mean that they are akin to risk factors for the pathology concerned.

A *Jyotisha Muhurta* is an a priori selected starting time for a process or an event, from which detailed predictions of influences can be made concerning all aspects of life including health and disease for later times (Frawley, 2007; Rao et al., 2013a; Rao et al., 2013b; Shriram,1996).

Research studies demonstrated how vaccinations of small ruminants depend on *muhurta* taken as time of vaccination (Rao et al., 2014). Research on microbial vaccine production using *Jyotisha* statements as scientific conjectures thus provided guidelines by which to design the present experiments on *E. Coli* growth. Vaccine production processes exhibit large variations in quantity and quality. Since production protocols are standardized these present a mystery. All batches are evaluated before distribution.

Further experiments conducted at Bangalore Veterinary College in Hebbal, Bangalore, showed that variation in the final yield of veterinary vaccine produced can be predicted from the prevailing *Jyotisha Kundali* at the TOFIs which thus be taken as *muhurta* (Rao et al., 2014**).** The Jyotisha muhurta at TOFI can not only explain the variations but Rao et al., further hypothesize that TOFI can even influence the subtler processes inside the cells.

Although Dr Rameshrao and colleagues' work (Rao et al., 2013) yielded results of very high statistical power and significance, they cannot be easily reproduced as model organisms used are infectious and thereby requiring safety procedures. Repeating the same with simple apparatus, and with non-pathogenic safer organisms will make results accessible to lay people

and science students. Such work would create a scientific revolution in biology, and by extension in medicine.

Another observation from the 'time and biological effect' experiments of Ramesh Rao (Rao et al., 2013a; Rao et al., 2013b) was on highly variable cell growth (Macansantos & Quaranta, 2014; Schwabe & Bruggeman, 2014), which was reduced in microbial growth-related parameters (ex. Cell density, growth rate etc.) when the TOFIs are the same. Cultures started at the same *muhurta* time have smaller variance in growth parameters than those for which *muhurta* times are different. Thus, Ramesh Rao et al. paved the way to probe the mystery of large variations in biological processes like the quantity and quality in vaccine production processes by identifying the cause for variations: influence of TOFI on each process. His experiments also provided consistent empirical evidence that TOFI influences cellular processes.

The phenomenon of muhurta affecting cellular processes is yet to be resolved scientifically and it's understanding is totally inadequate. So it the case with for explanations offered for many biological processes like inconsistent vaccine production yield, unpredictable amounts and quality of product (Tomelleri et al., 2008; Detela et al., 2018) and cell growth itself is known to be widely variable (Macansantos & Quaranta, 2014; Schwabe & Bruggeman, 2014). Cell Growth is a phenomenon that undergoes naturally occurring variations both qualitatively and quantitatively. Simple microbial growth experiments in a colleges overlook such variations, attributing them to variations in ambience or seeing them as artefacts. The observed variations have never been satisfactorily scientifically explained and most of the reasons provided are considered putative (Macansantos & Quaranta, 2014).

This thesis reports a series of bacterial growth experiments testing the hypothesis that *variability in exponential phase growth rates of a non-pathogenic strain* of *E. Coli*, K-12 MG

1655, *cells is far smaller between growth curves with the same time of flask inoculation* (TOFI**)**, and that *this small variance would grow to the overall observed variance with increasing difference between starting times*. More specifically, it investigates the influence of time on the processes involved according to concept of time derived from India's traditional knowledge of *Jyotisha Sastra*.

The reported series of bacterial growth experiments tested and verified these experimental conjectures. They show that *variability in exponential phase growth rates is far smaller between growth curves with the same* TOFIs *than for identical growth processes conducted over many months*; further, *variance gradually grows as difference between start times increases*. Nothing has previously been proposed to solve the variability dilemma. These results suggest heterogeneity depending on starting time, and represent the first step towards elucidating the *Jyotisha*-based solution.

Of these *E. Coli* bacterial growth experiments conducted on six days of total and partial eclipses, Solar eclipses slowed bacterial growth rate to a greater extent than lunar eclipses; total eclipses showed greater impact than partial eclipses. The solar eclipse results are consistent with the earlier findings; the lunar eclipse results are smaller in magnitude, indicating weaker effects and thus suggest that eclipses slow exponential phase bacterial growth rates.

The theory involves time-dependent influences acting on loci of control of cellular regulation processes, sited at criticality (Bak et al., 1987) by complexity biology (Kauffman, 1996; Nurse, 2014). Such influences may result in a paradigm shift in understanding cell biology (Nurse,2014). Cell processes and their regulation comprise the heart of biology and medicine; both disciplines may be deeply influenced.

Other very important observations:

Out of the total number of growth experiments conducted at 102 different TOFIs, it is

noticed that in the sets of two groups of growth experiments done, the first set with *Guru graha* in *Kanya lagna* and the second set with *Rahu* in *Simha lagna*, at the rate of two TOFIs in the same day, the set of growth curves with *Rahu in Simha lagna* exhibited lower growth rate significantly more often. This unbalanced difference was due to the *graha* in Lagna, *Guru* vs. *Rahu*. A clearly heterogeneous factor in the dimension of time.

Grahas possessing Effective Shadbalas, those having obtained net Shadbala value more than their specified Pinda values and the favourable 'Tithi', the arc-angular distance between grahas Surya and Chandra appear to influence bacterial growth behaviour. And grahas Sani and Kuja having higher Shadbalas act, as tradition puts it, mostly "inauspiciously", including on growth patterns. Detailed procedure to compute Shadbalas is given in Appendix -3.

Influence of grahas never works in isolation. All of them act in tandem; in relation to each other. They may be considered as "multi-dimensional vectors of very subtle energy forms" that are capable to influence in all possible directions and dimensions.

In this light, the thesis is set out as follows:

Chapter 2 presents basic concepts in *Jyotisha*. Such traditional considerations are not proved in any logical way. Long experience shows that they work. They are phenomenological. Empirically they seem correct. These traditional considerations help delineate a person's birth chart to unravel hidden aspects of life.

Chapter 2 also discusses the theoretical aspects of Vedanga Jyotisha hailed as a "Holistic Spiritual Science". Jyotisha is praised as "eye of *Vedas*, *Jyotisha Veda Chakshu*" and the 'Science of the Sciences' in the Vedic literature. And the same elaborates on the primary role of this sixth Vedanga, Jyotisha sidereal astrology in the Vedic Culture and Sanatana Dharma, which embody the four concepts as goals of life of viz., Dharma, Artha, Kama and Moksha,

and presenting possibilities of spiritual progress of people judged from their birth charts with an emphasis to lead a life as per chaturvidha purushardha.

Chapter 3 reviews aspects of modern scientific literature with regard to the main thrust of this thesis that there exist 'starting time effects' in many biological processes possibly due to changes they make on these processes like for example, metabolism and future research scope.

Chapter 4 presents the aims and objectives of the various experiments in light of the whole program, and its various experimental and null hypotheses.

Chapter 5 presents the Materials and Methods utilized in this PhD research work.

Chapter 6 gives Results obtained using Materials and employing Methods cited in Chapter 5.

Chapter 7 presents Discussion about analyzed data testing the experimental null hypothesis: *anomalous variations associated with starting time do not exist.* Testing null hypotheses rather than precise evaluation of effect magnitudes is given importance. The Discussion presents their implications, individually and as a whole, on:

(i) the possibility of Nava graha influencing biological processes;

(ii) our understanding of the influences of eclipses on the biosphere;

(iii) the scientific understanding of Jyotisha; and

(iv) the scientific understanding of time itself.

Chapter 8 presents the Summary and Conclusions of this PhD thesis research work.

Further, the following are appended for necessary information.

Appendix 1 gives scanned soft copy of approval of Institutional Ethical Committee.

Appendix 2 gives the List of publications from this doctoral thesis.

Appendix 3 details elaborate procedures for computing Shadbalas for Sapta grahas.

Appendix 4 gives raw data for Eclipse days' GC Experiments in Tables A 4.1 and A 4.2.