KĀLA YOGA: AN EXPERIMENTAL STUDY DEMONSTRATING THE INFLUENCE OF TIME ON MICROBES OF VETERINARY IMPORTANCE FROM AN ASTROMEDICINE PERSPECTIVE

Thesis Submitted for the Award of

DOCTOR OF PHILOSOPHY (YOGA)

By

RAMESH RAO N.

Under the Guidance of

ALEX HANKEY, Ph.D.
H.R. NAGENDRA, Ph.D.

SWAMI VIVEKANANDA YOGA ANUSANDHANA SAMSTHANA
(declared as Deemed University under Section 3 of the UGC Act, 1956)
BANGALORE - 560 019
I N D I A

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D E C L A R A T I O N

I hereby declare that this study was conducted by me at Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA), Bengaluru, under the guidance of Dr. Alex Hankey, Distinguished Professor of Division of Yoga and Physical Sciences, S-VYASA University Bengaluru and Dr. H.R. Nagendra, Professor, Division of Yoga-Spirituality, S-VYASA University Bengaluru.

I also declare that the subject matter of my thesis entitled KĀLA YOGA: AN EXPERIMENTAL STUDY DEMONSTRATING THE INFLUENCE OF TIME ON MICROBES OF VETERINARY IMPORTANCE FROM AN ASTROMEDICINE PERSPECTIVE has not previously formed the basis of the award of any degree, diploma, associateship, fellowship or similar titles.

Date: 7th December, 2013 **Ramesh Rao N.**

Place: Bengaluru (Candidate)

C E R T I F I C A T E

This is to certify that Rameshrao N. who was given Ph.D. registration with effect from January 12, 2004 by Swami Vivekananda Yoga Anusandhana Samsthana, Deemed University under the Division of Yoga and Life Sciences has successfully completed the required 'training' in acquiring the relevant background knowledge and has completed the required 'course of research' for not less than two years to submit this thesis entitled KĀLA YOGA: AN EXPERIMENTAL STUDY DEMONSTRATING THE INFLUENCE OF TIME ON MICROBES OF VETERINARY IMPORTANCE FROM AN ASTROMEDICINE PERSPECTIVE as per the regulations of the University.

We also declare that the subject matter of the thesis entitled KĀLA YOGA: AN EXPERIMENTAL STUDY DEMONSTRATING THE INFLUENCE OF TIME ON MICROBES OF VETERINARY IMPORTANCE FROM AN ASTROMEDICINE PERSPECTIVE has not previously formed the basis of the award of any degree, diploma, associate-ship, fellowship or similar titles.

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A C K N O W L E D G E M E N T

I wish to express my deepest gratitude to my guides, Dr. Alex Hankey and Dr. H.R. Nagendra for their guidance and encouragement.

I would also like to thank my scientific advisers and collaborators, Dr C. Renukaprasad, Dr M. Gajendragad, Dr Prabhudas, Dr S.M. Byregowda, Dr Yeshvanth, Dr Asha-Mayana, Dr Suresh Sharma, Dr. Madan Thangavelu, Dr Nadeem M., Dr Deshpande J., Dr Shrinivas Reddy, Dr Shivakumar K., Dr Chandrashekar Murthy, Dr Honnappa, Dr Vasanth, Dr Subbukrishna and Dr Lalith Achuth for their support and help in carrying out and reporting the various experiments reported herein.

I shall be always grateful to my university Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA) for its support in promoting my research career, and also opening a window on its unique evolutionary Yoga programs.

I give my special thanks to my wife and family for all their patience, and all the support that they have extended during my study, and taking the burden of my absence.

Finally, I thank my Lord and Eternal Guru for providing all these aids to complete this work.

Date: 7th December, 2013
Place: Bengaluru

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1 INTRODUCTION

This thesis reports a series of experiments aimed at increasing the efficiency of production and delivery of veterinary vaccines for commercial livestock. More specifically, it investigates the influence of time on the processes involved according to conceptions of time derived from India's traditional knowledge. Discoveries made in the experiments have transformed it into a study of the scientific nature of time itself, derived from the observed impact of time on several classes of microbiological processes, including immune response to live and killed virus vaccines, the growth of bacteria and propagation of viruses for vaccines.

In India today, the animal livestock population is the highest of any country in the world. Its health is key to the welfare of large sections of India's still mostly rural population. Ongoing research is essential (Logan, 1993), (Purse, 2005). The once deadly Peste des Petits Ruminants (sheep plague), for example, is continuously monitored (Singh R.P., 2004) (Thombare N.N., 2009). Other commercial scourges of small ruminants include Bluetongue (Purse, 2005), caused by an *Orbivirus*, Black Quarter (Jindal N., 2009) (*Cl. Chauvoie*), Newcastle disease (Raniket virus) and REO virus in avian species (Farooq U., 2011) and Hemorrhagic Septicemia (*P. multocida*) (Someno S.H., 2005) (Begum K., 2006) in cattle. As if to emphasize this problem, October 2013 has seen epidemics with widespread fatalities all across Southern India caused by Foot and Mouth disease outbreaks in ruminants (Hussain K.J.M, 2008). Protecting the animal wealth of the nation requires preventative vaccination programs against all such pathogens, together with ongoing monitoring and active research and development. (Rajkumar K., 2003) (Sultana M, 2008) Designated vaccine research and production institutes make effective vaccines available to all farmers. The Institute for Animal Health and Veterinary Biologicals (IAH&VB) in Bangalore, where the experiments described here were performed, produces vaccines according to OIE (Organisation Internationale des Epizooties) manual specifications (Grimes S.E, 2002) (Lepp P.W, 2010), which standardize parameters at values

optimized for production purposes. Improving vaccine delivery, increases in productivity, quality or herd immunity all have significant economic implications. State biological institutes like IAH&VB continuously seek ways to improve vaccines, their production and distribution.

As in most, if not all, microbiological processes, both vaccine production and vaccination exhibit natural variations in quantity and quality, which are inadequately understood. Ensuring required quality necessitates evaluation of all production batches before distribution or sending to market. At IAH&VB, ongoing monitoring of vaccine production runs led to a possible identification of their cause: influence of starting times on the processes observed.

The hypothesis that led to this unusual observation originated in Indian traditional knowledge: starting times influence all processes, some are 'auspicious', some 'inauspicious', and the outcome of processes started at such times vary accordingly. The entire structure of ancient Indian culture was aimed at going to a state that such qualities of time could not touch, a state beyond time known as *Mahākāla* (Vatsayana K, 1996), beyond the 'bite of time'. The *Mahākāla* concept, central to conceptions of time in the Veda, sets the structure of life and living in a different context from that of western science, or indeed almost anything in western thought.

The idea came to test the idea of *qualities of time* in experimental hypotheses, by carefully selecting starting times for the processes involved, and making definite predictions about their relative outcomes. As such the approach seems to be original: surveying the peer-reviewed literature drew a blank; there are no papers testing this kind of hypothesis to review.We were thus led to propose an entirely original scientific investigation: that of systematic variation of output variables with *starting time* of microbiological processes – time of vaccination in the case of vaccination experiments, and of inoculation of growth media in vaccine production experiments.

Since these were to be pilot experiments, and vaccine production is already standardized, it was proposed that normal monitoring procedures carried out according to OIE protocols were sufficient to evaluate systematic effects: effectively zero cost means to study them. Identifying systematic sources of variance might lead to deeper understanding of the variations, and thus potentially to ways of making the processes more efficient.

The experiments that resulted from this new approach yielded the remarkable results (Rameshrao N, 2013a,b) reported in this thesis. Taken as a whole, the experiments provide consistent empirical evidence for the metaphysical effects predicted. They imply that choice of starting time influences cellular processes, and has purely biological effects. In this regard, several variables are already known to influence vaccine production, for example, temperature, pH, growth media, and initial inoculant concentration. OIE protocols attempt to optimize these, yet large variations in output are still observed, which are not yet understood. Several candidates for the cause of residual variations exist; one is biorhythms, which can produce variations of all kinds, for example, in disease outbreaks, dependent on age, sex and season. Biorhythms can influence rates of processes involved in vaccine production and uptake (Phillips A.C., 2008) (Fortier E.E., 2011), and could act differently at different starting times. However, when overall growth periods are whole numbers of 24 hours, as in several of the reported production processes, diurnal biorhythms cannot result in output variations.

A second possible explanation is natural statistical variation in reactions involving 'small numbers of big molecules' (Federoff N, 2002), the 'stochasticity hypothesis.'(Elowitz M.B., 2002) However, in the case of the results of the experiments described below, with statistically significant dependence on factors associated with starting time, i.e. time of day and day itself over periods of up to 18 days, stochasticity cannot explain observed time dependences, which therefore have important implications for stochasticity theory. A final possible explanation for the observed variations comes from complexity biology (Waldrop M, 1993), where natural

variation in response of regulatory systems to internal and external stimuli is known as 'fractal physiology'. (Bassingthwaite J.B, 1994) As discussed below, complexity seems the most probable source of starting-time related variance. Concerning the nature of time, the experiments imply that *time is heterogeneous*: it may have *associated qualities which can vary*, impacting the same process differently at different times.

In this light, the thesis is set out as follows: Chapter 2 explores ancient conceptions of time in the Veda and associated literature. Various conceptions of time from associated philosophies are discussed, showing how time was conceived as emerging from a timeless source, implying a profound relationship between time and the timeless. It also discusses how different qualities of light were associated with each period of time, and how the seven colors of the spectrum in outer sources of light were related to the light of subjective awareness and intelligence (*Jyoti*), including their physiological roles and qualities. Āyurveda 's conception of time and its relation to physiological processes is also discussed. Chapter 3 reviews aspects of modern literature.

Chapter 4 presents the aims and objectives of the various experiments in light of the whole program, and its various experimental and null hypotheses. The Results section, Chapters 5 to 8, presents eleven datasets on vaccination and vaccine production. Data analyses test the experimental null hypothesis: ***anomalous variations associated with starting time do not exist.*** Testing null hypotheses rather than precise evaluation of effect magnitudes is the aim, as it must be for first studies in new scientific fields. Chapter 9 presents their implications, individually and as a whole, for (i) optimizing processes of vaccination and vaccine production; (ii) other industrial processes depending on microbial growth more generally; (iii) the possibility of remote influences on and between biological processes more generally; (iv) our understanding of the influences of eclipses on the biosphere; (v) implications for Gaia: the biosphere can act as a 'whole system'; and (vi) the scientific understanding of (a) *Jyotiṣa*, (b) life and its origins; and, finally, (c) time itself.

2 CONCEPT OF TIME ACCORDING TO ANCIENT TEXTS

Time space and causation are like a glass through which the Absolute is seen: in That there is neither time, space, nor causation -- Vivekananda S. (2005)

2.1 AIMS

To explore higher meaningss of Time and the Timeless in ncient texts and philosophy.

2.2 THE VEDIC CONCEPT OF TIME

The **Sanskrit language** has several words denoting different aspects of the time concept

1) Kāla: to calculate, enumerate, also death. 2) Diṣṭa: time assignment, appointed moments. . 3) Añca: incomparable, unattainable, unobstructed. 4) Samaya: right time to do anything involving the study of energy and force in time-space. Time is all pervading, it concerns all of us; man lives in time, is aware of time, reckons with time. Time is the matrix of all distinctions.

Human self-conscious experience is inseparable from time. Every human activity or experience, whether physical or psychological, social or environmental, is inexorably linked to the passage of time. Experience of the passage of time lies deep within. In the depth of a full mind, distinction can be made between the Real and unreal. There, time, *kāla*, is experienced as neither merely objective nor purely subjective. The concept of 'real time' is not possible within a dualistic vision.

The Vedic concept of time thus encompasses the movement of everything in existence, particularly for our purposes planets and cycles of human life. In the traditional Vedic conception of time, time has two aspects: the timelessness of eternity, *Mahākāla*, within which all events take place in relative time, *Kāla*. (Vatsayana K, 1996) The structure of Vedic culture aimed to return to *mokṣa* i.e. to *Mahākāla*'s timeless eternity from within the bonds of *Kāla* time. The eternal was regarded as the unmanifest source of all the laws of nature governing every aspect of existence within time, a state of Absolute Pure Being, itself Self-Referral and self-sufficient. The unmanifest source is thus pure consciousness, devoid of any external object,

conscious of Self alone. These dynamics of self-referral consciousness embody the dynamics of all the laws of Nature in their unmanifest state (Nader A, 2000). *Mahākāla* is regarded as Bhagavān – self originated, nothing generates it. It is without origin. In contrast, *kāla* is always moving on (*gatiśīla*), it can never be stopped. The name '*kāla*' signifies both time and death. *Kāla* is responsible for the life and death of each human being. *Kāla* is the destroyer of all existence, carrying all organisms towards physical destruction. Time is personified as the God of death (*Yama*). Because death is the limiting factor in human life, *kāla* determines how long a person lives upon earth – influenced by their time of birth. So time and death are associated; a person's time on earth begins with birth and ends with death. (Vyāsa V, 2011)

Qualities attached to time are responsible for all happiness and sorrow. These concerns are the domain of *Jyotiṣa*. (Parashara M., 1994) However, the spirit in man (*ātman*) is unaffected by qualities, being the unchanging basis on which the tapestry of qualities is hung. For the spirit, there is no death, no time (Vyāsa V. 1996, II.20), because it is without beginning and without end. The Vedic concept of time is centered round each soul's experience: a spark of the eternal flame making its entry into the realm of time, and, eventually, the transition to *mokṣa*, from *kāla* to *Mahākāla*, through meditation and ritual. (Vyāsa V. 1996, II.71) (Valmiki M., 1984)

2.3 RITUAL TIME

All ritual is aimed at the eternal, *Mahākāla*, (Vatsayana K, 1996) creating an essential connection between the two *kālas*. Ritual time (*karma kāla*) mediates between *kāla* and *Mahākāla*. (Baidyanath S, 1996, p250-251) Ritual itself is an aspect of the law that transcends all laws, causes the birth and death of all corporeal beings, things and events; and upholds the cosmos by its own power. (Vyāsa V, 2011) Whatever is created in time (*kāla*) naturally dissolves into timelessness, *Mahākāla*. To a man in the tradition, life is lived in a constant state of ritual; there is no time other than ritual time. (Baidyanath S, 1996) Time, space and man as a time-space machine are ritually constructed, and carry the seeds of cosmic harmony. The

ultimate goal of all ritual is to transcend relative time, *anitya kāla*, to *Mahākāla*, ritual time, which is characterized by *Akarma* (action not generating karma), *Akrama* (no perceived order), *Akāla* (beyond time). (Baidyanath S, 1996, p250-251)

Ritual time is measured by uttering an appropriate number of mantras, counting beads, reading scripture, using ritual instruments. By increasing the number of performers, ritual time can be accelerated with each successive performance. When a ritual is performed, its ritual time and ritual space are inextricably bound together. The impact of, or merit accrued from, a ritual action, e.g. bathing in a river, can be increased many times by performing it at an auspicious time. Similarly, directions faced by performers of rituals at various times are prescribed. Each ritual has component actions (*karma*), which must be performed in a prescribed order (*krama*), at appropriate times (ritual *kāla*). These make up the *Mahakarma* – great act – within the *Mahākāla* of the ritual. (Baidyanath S, 1996) They can best be understood by analogy with the three concepts of body–mind–spirit, which together participate as a single entity. Ultimately, as ritual is rooted in the transcendent, the ultimate goal of ritual is to transcend

2.4 CYCLES OF COSMIC TIME

Cosmic time is perceived as cyclical, a never ending process that is both repetitive and exhaustive. Each time cycle has three components: *Sṛṣṭi* – creation, *Stithi* – continuation and *Laya* – dissolution. Each cycle begins with creation, continues for a certain duration, and then dissolves into nothingness; repeating after a brief respite. The same divisions are found in a day: each day consists of dawn, daytime and dusk, finally dissolving into the darkness of night; similarly for individual life, consisting of childhood-adulthood-old age.

TABLE 2a: The Vedic Divisions of Cosmic Time

NAME OF THE DIVISION	DURATION IN HUMAN YEARS	REMARKS
Kalpa	8.64 billion years	A day of Brahma
Arthakalpa	4.32 billion years	A day or a night of Brahma
Mahāyuga	4.32 million years	1 Mahāyuga =4 Yugas
Satyayuga	1.728 million years	
Tretayuga	1.296 million years	
Dvāparayuga	864 thousand years	
Kaliyuga	432 thousand years	
Manvantara	308 million years	
1 year of Brahma	3.1104×10^{15} years	Equals 360 kalpa's
1 Mahakalpa	3.1104×10^{17} years	100 years of Brahma's time-space

The Vedic approach divides cosmic time into *kalpas* (Vyāsa M., 1840) , a day and night in the time of Brahma, the creator. Each *kalpa* is said to equal to 8.64 billion years. One *kalpa* consists of two *arthakalps* (4.32 billion years of each), which are a day and night of Brahma. Each arthakalpa comprises 1000 mahāyuga's. Each Mahāyuga is divided into four yuga's namely Kritiyuga, Tretayuga, Dvāparayuga and Kaliyuga (Vyāsa M., 1840) (See Table 2a)

2.5 TIME IN VEDIC TEXTS

Veda is pure knowledge, with two aspects, Mantra and Brāhmaṇa, knowledge and organizing power. Both aspects contain knowledge of time, as do other aspects of the Vedic Literature, particularly the Upaveda and Vedāṅga which we treat separately below.

2.5.1 Veda - Mantra portion

Atharva Veda Sūktas XIX.53 and XIX.54 constitute the well-known cosmological *Kāla Sūktas* which have been much commented on, and characterized as enigmatic, and "of incomparable beauty and suggestive force". (Narahari B.N., 2013) The translation given below is based on the usual *Padavibhāga*.

ATHARVA VEDA XIX. 53. Prayer to Kâla (time), personified as a primordial power

१९ .५३ कालसूक्तम् त्रिपञ्चाशं सूक्तम् 19 .53 kālasūktam tripañcāśaṁ sūktam

1

कालो अश्वो वहति सप्तरश्मिः सहस्राक्षो अजरो भूमिरेताः।
तमा रोहन्ति कवयो विपश्चितस्तस्य चक्रा भुवनानि विश्वा॥१॥

kālo aśvo vahati saptaraśmiḥ sahasrākṣo ajaro bhūmiretāḥ|
tamā rohanti kavayo vipaścitastasya cakrā bhuvanāni viśvā||1||

Time is like a steed running with seven reins (rays), thousand-eyed, Ageless, rich in seed.
The *Ṛśis* thinking holy thoughts mount him, All beings (worlds) are his wheels.

2

सप्त चक्रान्वहति काल एष सप्तास्य नाभीरमृतं न्वक्षः।
स इमा विश्वा भुवनान्यञ्जत्कालः स ईयते प्रथमो नु देवः॥२॥

sapta cakrānvahati kāla eṣa saptāsya nābhīramṛtaṁ nvakṣaḥ|
sa imā viśvā bhuvanānyañjatkālaḥ sa īyate prathamo nu devaḥ||2||

With seven wheels Time doth ride, seven naves has he, Immortality is his axle.
He carries hither all these beings (worlds). Time, the first god, now hastens onward.

3

पूर्णः कुम्भोऽधि काल आहितस्तं वै पश्यामो बहुधा नु सन्तः।
स इमा विश्वा भुवनानि प्रत्यङ् कालं तमाहुः परमे व्योमन्॥३॥

pūrṇaḥ kumbho'dhi kāla āhitastaṁ vai paśyāmo bahudhā nu santaḥ|
sa imā viśvā bhuvanāni pratyaṅ kālaṁ tamāhuḥ parame vyoman||3||

A full jar has been placed upon him; Time, verily, we see existing in many forms.
He carries away all beings (worlds); they call him Time in the highest heaven.

4

स एव सं भुवनान्याभरत्स एव सं भुवनानि पर्यैत्।
पिता सन्नभवत्पुत्र एषां तस्माद्वै नान्यत्परमस्ति तेजः॥४॥

sa eva saṁ bhuvanānyābharatsa eva saṁ bhuvanāni paryait|
pitā sannabhavatputra eṣāṁ tasmādvai nānyatparamasti tejaḥ||4||

He surely did bring hither all the beings (worlds),
he surely did encompass all the beings (worlds). Being their father,
he became their son; there is, verily, no other force, higher than he**.**

5

कालोऽमूं दिवमजनयत्काल इमाः
पृथिवीरुत। कालो ह भूतं भव्यं चेषितं ह वि तिष्ठते॥५॥

kālo'mūṁ divamajanayatkāla imāḥ pṛthivīruta|
kālo ha bhūtaṁ bhavyaṁ ceṣitaṁ ha vi tiṣṭhate||5||

Time begot yonder heaven, also these earths. Urged forth by Time,
That which was, and that which shall be, spread out.

6

कालो भूमिमसृजत कालो तपति सूर्यः।
काले ह विश्वा भूतानि काले चक्षुर्वि पश्यति॥६॥

kālo bhūmimasṛjata kālo tapati sūryaḥ|
kāle ha viśvā bhūtāni kāle cakṣurvi paśyati||6||

Time created the earth; in Time the sun burns;
in Time all beings exist; in Time the eye looks out.

7

काले मनः काले प्राणः काले नाम समाहितम्।
कालेन सर्वा नन्दन्त्यागतेन प्रजा इमाः॥७॥

kāle manaḥ kāle prāṇaḥ kāle nāma samāhitam|
kālena sarvā nandantyāgatena prajā imāḥ||7||

In Time mind and breath are fixed, in Time names are fixed

when Time has arrived all creatures rejoice.

8

काले तपः काले ज्येष्ठं काले ब्रह्म समाहितम्।
कालो ह सर्वस्येश्वरो यः पितासीत्प्रजापतेः॥८॥

kāle tapaḥ kāle jyeṣṭhaṁ kāle brahma samāhitam|
kālo ha sarvasyeśvaro yaḥ pitāsītprajāpateḥ||8||

In Time is *tapas*; in Time is the highest being; in Time is *brahma*

(spiritual exaltation); Time is the lord of all, he was the father of *Prajāpati*.

9

तेनेषितं तेन जातं तदु तस्मिन्प्रतिष्ठितम्।कालो
ह ब्रह्म भूत्त्वा बिभर्ति परमेष्ठिनम्॥९॥

teneṣitaṁ tena jātaṁ tadu tasminpratiṣṭhitam|
kālo ha brahma bhūttvā bibharti parameṣṭhinam||9||

By him this (universe) was urged forth, by him it was begotten,
upon him all this was founded. Truly, having become *brahma*,
time supports *Parameṣṭhin* (the highest lord).

10

कालः प्रजा असृजत कालो अग्रे प्रजापतिम्।
स्वयंभूःकश्यपः कालात्तपः कालादजायत॥१०॥

kālaḥ prajā asṛjata kālo agre prajāpatim
|svayaṁbhūḥ kaśyapaḥ kālāttapaḥ kālādajāyata||10||

Time created creatures (*pragâh*), and in the beginning,he created the lord of creatures (*Prâjapati*);from Time were born the self-existing *Kashyapa* and *tapas*.

अथर्ववेदः १९ .५४ कालसूक्तम् चतुष्पञ्चाशं सूक्तम्

Atharvavedah 19 .54 kālasūktam catuṣpañcāśaṁ sūktam

XIX.54. Prayer to Kâla, (as a personified primordial power).

1

कालादापः समभवन्कालाद् ब्रह तपो दिशः
।कालेनोदेति सूर्यः काले नि विशते पुनः॥१॥

kālādāpaḥ samabhavankālād braha tapo diśaḥ|
kālenodeti sūryaḥ kāle ni viśate punaḥ||1||

From Time the waters arose, from Time *Brahma*, *tapas*, and the regions of space arose.
Through Time the Sun rises, in Time again he descends.

2

कालेन वातः पवते कालेन पृथिवी मही।द्यौर्मही काल आहिता॥२॥

kālena vātaḥ pavate kālena pṛthivī mahī|dyaurmahī kāla āhitā||2||

Through Time blows *Vāyu*, the wind; in Time are the vast earth and sky fixed;
in Time the son (*Prajāpati*) begot of yore that which was, and that which shall be.

3

कालो ह भूतं भव्यं च पुत्रो अजनयत्पुरा।कालादृचः
समभवन्यजुः कालादजायत॥३॥

kālo ha bhūtaṁ bhavyaṁ ca putro ajanayatpurā|
kālādṛcaḥ samabhavanyajuḥ kālādajāyata ||3||

From Time came the Ṛks, from Him was the *Yajus* born;

Time put forth the sacrifice, the imperishable share of the gods.

4

कालो यज्ञं समैरयद्देवेभ्यो भागमक्षितम्।काले गन्धर्वाप्सरसः
काले लोकाः प्रतिष्ठिताः॥४॥

kālo yajñaṁ samairayaddevebhyo bhāgamakṣitam|
kāle gandharvāpsarasaḥ kāle lokāḥ pratiṣṭhitāḥ||4||

Upon Time the *Gandharvas* and *Apsarāses* are founded,

upon Time also the lokas, the worlds above and below,

in Time the *Angirases* and *Atharvans* rule over the heavens.

2.5.2 Veda: Brāhmaṇa portion

The Brāhmaṇa portion of the Veda has three components, Brāhmaṇas, Āraṇyakas and Upaniṣads. Here we present the understanding of time from the Upaniṣads. The first Upaniṣad, the Bṛhadāraṇyaka Upaniṣad contains the beautiful statement,

स एव संवत्सरः प्रजापतिः षोडषकलः
तस्य रात्र्या एव पञ्चदशकलः
ध्रुवैवास्या षोडषी कला

sa eva saṁvatsaraḥ prajāpatiḥ ṣoḍaṣakalaḥ,
tasya rātryā eva pañcadaśakalaḥ
dhruvaivāsyā ṣoḍaṣī kalā

We can contemplate the creative principle
in relationship to the principle or passage of time.
(Krishnananda S., 2013)

The Upaniṣhad gives us structures for contemplation. Anything and everything in this world of space, time and objects can become an instrument to aid meditation arrive at the Absolute; any

object, all may become a passage to the infinite. *Soḍaśa-kalaḥprajāpatiḥ:* Prajāpati is the Creator. He is sixteenfold in power, as it were, with sixteen forces, sixteen aspects of energy, or sixteen digits of expression, compared here, for the purpose of meditation, with the sixteen digits of the moon, i.e. days and nights constituting half the lunar month, which represent sixteen processes. There are fifteen days in the bright half of the lunar month, of the waxing moon, and fifteen in the dark half, of the waning moon. Each 24 hour period is connected to one 'digit' of the moon, or mental function in the individual, since Moon is the presiding deity over the mind. The waxing and the waning of the moon affects the mental horizon, as in the case of the insane who are said to be affected by movement of the moon; even normal people are influenced, though they do not feel the effects so much. The intense force exerted on our own minds by our egos, prevents us feeling the force of the moon on our minds, but if we relax the mind completely and do not impress the ego on it so much, we may recognize the distinction between one day and the next as the moon waxes and wanes. These distinctive properties of mind are the same as the sixteen powers attributed to full incarnations of God– *soḍasa-kalā-mūrti*. The sixteen Kalās, or digits, are the sixteen powers of mind. They are not manifest in every individual, no one is entirely in possession of their own mind. We have control over certain aspects of our mind, but not its entirety. When, in our soul, we identify with the whole mind, we gain the ability to lift up the world by our hands. Limited, or partial identification of the mind with absolute consciousness prevents this power coming to just anyone. (Krishnananda S. 2013)

2.5.3 Upaniṣad

The Upaniṣads propose the concept of māyā: only the Absolute is real. Divisible time, in which change occurs, is 'unreal'. The whole concept of change is due to a misconception, an illusion, because the Real, the Absolute, is not in time. Rather the Seer is being absorbed into the Whole. Once in that state, the Seer becomes *Mahākāla*. (Bhaidyanath S, 1996). The Upaniṣads extol

the virtues of Om, the sacred syllable representing Brahman as both cause and effect. Om is the phenomenal world, past, present and future and Trikālātītam. Time past-present-future are relative terms; Trikālātītam refers to Absolute time. All that exists beyond this world is also *Omkāra*, Brahman itself. When we relate to particular times and places, we are speaking of the individual, but Brahman is not specific to any Time or place, he is beyond Time and Space – like *Omkāra*.

Māṇḍūkya Kārikā Gaudapada (Nikhilananda S, 1936)

अ स्इइरित् स्अ इविनित कलट्सूत् ऊतन म्ण्य्ण्ते कलिच्ण्त्क। म - क - ८।
इच्च्म्त्र प्रभो स्इरिति स्औ विनिचित्। क्ल्त्प्रस्ति भ्त्न् मन्यन्ते क्लचिन्तक्॥ म् - क् - ८॥

icchämätraà prabhoù såñöiriti såñöau viniçcitäù |
kälätprasütià bhütänää manyante kälacintakäù || mä – kä - 8||

म्कर्अवे अष्य् मन्समण्य्मुट्क्क्म् मअस्ंइत्प्अ तु ल्य्समण्य्मेव् च्। म - क - २१।
मक्रभ्वे प्रज्अस्य म्नस्म्न्यमुत्कअम्। म्त्रसम्प्रतिपत्तौ तु लयस्म्न्यमेव च॥ म् - क् - २१॥

makärabhäve präjïasya mänasämänyamutkaöam |
mäträsampratipattau tu layasämänyameva ca || mä – kä – 21||

Time is supreme; Time Science is of the highest importance. (Raja Rao M.B, 1974, p. 226) Time is the creator of everything (Vyāsa M., 1840), all things are under the shelter of Brahman. The Sun, Moon and stars do not shine in the presence of Brahman. Implication: they have no light of their own, but derive their light from Brahman. All things are under the shelter of Brahman. Nothing exists independent of Brahman, nothing can surpass it. It is timeless and Absolute. (Nikhilananda S, 1936, p. 6)

Kaṭhopaniṣat (Vasu S.C, 1905)

सर्वे वेद् यत्पदम्मनन्ति तप्सि सर्वि च यद्वदन्ति
यदिच्चन्तो ब्रह्मचर्य चरन्तितत्ते पद सग्रहे ब्रव्म्योमित्येतत्

sarve ved yatpadammananti tapsi sarvi ca yadvadanti |
yadiccanto brahmacarya carantitatte pada sagrahea bravmyomityetat || kaha-2-15||

2-15. I will give you the Word all the scriptures
Glorify, all spiritual disciplines
Express, to attain which aspirants lead
A life of sense-restraint and self-naughting.
It is OM. This symbol of the Godhead
Is the highest. Realizing it one finds
Complete fulfillment of all one's longings.

(Easwaran E. 2013)

Only the Absolute is real. Divisible time, in which change occurs, is 'unreal'. The whole concept of change is an illusion, because the Real, the Absolute, is not in time. In that state, the Seer is absorbed into the Whole – *Mahakala.* Om stands for Brahman as both cause and effect. Om is the phenomenal world, past, present and future. Anything beyond this is also Omkara, Brahman itself. Brahman is not specific to any Time or place, he is beyond Time and Space – like *Omkara*. Time is supreme; Time Science is of the highest importance. Time is the creator of everything[43]All things are under the shelter of Brahman. Nothing exists independent of Brahman, nothing can surpass it. It is timeless and Absolute.

2.5.4 Upāṅgas: Subordinate Limbs of the Veda, Six Systems of Indian Philosophy

Overall the ***Ṣaḍ Darśana*** consider the apparently threefold character of time, past – present – future, one eternal flow without a break, an indivisible unbroken continuity. When a past event occurred, time was in the present. Time, when it is occurring, is always present, and when events will occur, Time is future.

Experience of time enables the mind to relate what has happened, what is yet to happen and thus to divide time into past, present and future, but Time's true character is the eternal present. In reality past and future are also present. (McCormick A, 2007) Space and time exist with reference to subjective being, the consciousness principle. When consciousness manifests, time assumes spatio-temporal forms, and subjective being becomes mental – *Manomāyā*. Space and

time are twin terms of conscious creative intelligence. In speech alone one separates substance from its source, never in fact, never in experience. When self-consciousness becomes manifest, it becomes subject to existence embedded in space-time. The supreme truth is that, "Without Me, there is no space or time, yet My ultimate being has become all space-time: I am everywhere, in all time." (Ramana M., 1931)

2.5.4.1 *Nyāya-Vaiśeṣika* (NV)

Nyāya-Vaiśeṣika deals mainly with physics, chemistry and other material sciences including reasoning or logic, metaphysical studies i.e. search for knowledge of God. It is part science and part philosophy, dealing with nine elementary concepts – Earth, Water, Fire, Air, Akasha, Time, Direction in space, Mind and Ātman.

Definition: time is inferred from the relation between past (*Bhūtakāla*)
and future (*Bhaviṣyat Kāla*), discounting that of place. It is marked by association of an event with the sun's revolution and is measured by *kshana*, *dina*, *rtu* (seasons), *ayana*, *saṁvatsara* etc. *Kāla* is an entity to be considered when dealing with chemical and physical changes. NV refers to Soul, Ether, Time and Space as VIBHO – infinite and indivisible. It offers explanations by example: the ripening of a mango. A mango stored in hay, fruits are their own color and taste good, and color develops on it. If a mango is exposed to hot sun – the fruit ripens quickly, but its qualities are different. A mango exposed to hot air ripens quickest, but lacks good taste.In all three conditions, time is the main factor effecting biochemical changes and has relatively more importance. (Laxmipathi A., 1973a)

2.5.4.2 *Sāṅkhya-Yoga:*

Sāṅkhya-Yoga Time is an elemental mental construct (*buddhinirmāṇa*), a structure of the mind. Space and time do not exist separately, but are 'interpenetrating'. Space is not like a box, in which all things exist, but is continuous with all objects. All matter has evolved out of

space and time. It makes its first physical manifestation as a mode of space. Time is regarded as the Original Dynamic, existing prior to space and determining its evolution or emergence. Time exists in all products of space in the material / biological worlds. (Laxmipathi A., 1973b)

2.5.4.3 *Vedānta*

In *Vedānta*, *Vāsiṣṭha Advaita* accepts time as a real entity, an eternal flow without beginning or end, inseparably associated with everything in the universe. Time is an inseparable attribute of *paramātman*, it is of two kinds, indivisible or divisible. Indivisible time is similar to absolute time; divisible time is the mind's projection – the cause of experience of past-present-future. (Thathachar L, 1996) Acceptance of such reality depends on *Pramāna*, valid knowledge, based on perception-inference-verbal testimony. Time is the instrument of God creating experiences in his field of play. In his own eternal sphere, time plays no role as it does here, God himself has no need of time. Time is an accessory cause of transformation of primordial matter and its evolutes – the material cause of its own transformation eg *nimisa*, *kasta*, *kāla*, etc. (Thathachar L, 1996)

2.5.5 Yoga-Vāsiṣṭha: The Enlightenment of Shri Rama by Brahmaṛśi Vasiṣṭha

The Yoga-Vāsiṣṭha, narrates the story of an immortal, Kāka Bhuṣuṇḍa, the King of the Crows. When questioned by Śrī Rāma, He narrates the secret of long life as follows. "Death does not come nor does the thread of time work in one, whose heart does not carry any desire or anger; whose mind is not fickle, and reposes in the most holy abode; whose contemplation of Self destroying all sorrows is excellent; who has awareness of prāṇa. When practiced steadily, ageing time does not apply. By eliminating mind content, and steady practice of prāṇāyama, consciousness attains the Absolute, timeless state. For that, mind should become stainless Self – the cause of long life. Then, the bite of time fails. (Venkatesananda S, 1993)

2.5.6 Itihāsa (the Epics):

The Epics tell the story of great heroes, whose lives exemplify Dharma. The paramount section of the Epics is Bhagavad Gītā, the Upaniṣadic text beloved of all India.

The Bhagavad-Gītā (Vyāsa V., 1996, X.33 and XI.32) state,

अक्षराणामकारोऽस्मि द्वन्द्वः सामासिकस्य च ।

अहमेवाक्षयः कालो धाताहं विश्वतोमुखः ॥ १०-३३ ॥

Akṣarāṇāmakāro'smi dvandvaḥ sāmāsikasya ca ।
Ahamevākṣayaḥ kālo dhātāhaṁ viśvatomukhaḥ || 10-33||

Of letters, I am '***A***', the first; of word forms, I am the dual;
I am eternal above time's flow and four-faced Brahmā

कालोऽस्मि लोकक्षयकृत्प्रवृद्धो लोकान्समाहर्तुमिह प्रवृत्तः ।

ऋतेऽपि त्वां न भविष्यन्ति सर्वे येऽवस्थिताः प्रत्यनीकेषु योधाः ॥ ११-३२ ॥

Kālo'smi lokakṣayakṛtpravṛddho lokānsamāhartumiha pravṛttaḥ ।
Ṛte'pi tvāṁ na bhaviṣyanti sarv ye'vasthitāḥ pratyanīkeṣu yodhāḥ || 11-32||

I am terrible time, destroyer of all beings in all worlds;
engaged in destroying all beings in this world;
of the heroic soldiers now present in the opposing army
even without you, none will be spared.

परस्तस्मात्तु भावोऽन्योऽव्यक्तोऽव्यक्तात्सनातनः ।

यः स सर्वेषु भूतेषु नश्यत्सु न विनश्यति ॥ ८-२० ॥

Parastasmāttu bhāvo'nyo'vyakto'vyaktātsanātanaḥ ।
Yaḥ sa sarveṣu bhūteṣu naśyatsu na vinaśyati || 8-20||

…. another unmanifest that is eternal, superior in nature to the unmanifest of Brahmā,
That is never destroyed when all living beings periish

As the unfailing recorder of appearance-stay-disappearance of things, time is identified as Ishwara. Divisions of time have their beginning and end, but time itself is without beginning. Endlessly flowing and equated with God Supreme it is called *Mahākāla*. All existence is in time, but the timeless *Mahākāla* rooted in nonexistence is different. There are three varieties

of Kāla are: Kāla in the sense of running time e.g. (Ageing Processes); Kāla in prakṛti (Āyurveda); Kāla as the eternal embodiment of knowledge and bliss. (10.33) The Lord Himself is embodied as time. He states (11.32) "I am the mighty world destroyer". All events in nature are 'buried in time'. Those who attain the eternal, unmanifest, immortal state beyond time, the Lord's supreme abode, will not return. Vāsudeva is mahā-ātman – Ananta because he transcends time, space and causation. Time knowledge is a sovereign science – supreme, holy, directly enjoyable, imperishable, an unmanifest divinity, ***ananta*** (endless).

2.6 ORTHODOX AND HETERODOX SECTS

2.6.1 Orthodox Traditions

2.6.1.1 *Time in Sanātana Dharma*

"Time dwells in the depths of full mind. Deep inside us it interweaves the real and the unreal. Sacred time is pure becoming, where the time of physics is no longer determinant. It is the flowing onward of the essence of life, a value centre in many principles of being, as we seek to create newer and even individualized eyes. The mind renews itself in the intuition of time. It is the laughter of the gods, out of which emerge our newest sensibilities of expanding consciousness. It brings a polytheistic instinct into monotheistic thinking. Time is the big and beautiful of human knowledge that comprises the immeasurable infinite, away from the absolute silence concerning the meaning of life. It engulfs man eternally, in a now that has no end. The eternal (*sanātana*) of the infinite Being is Time that upholds (*dharma*), the cosmic and human order, the *Sanātana Dharma* of India" (Lokeshchandra, 1996)

2.6.1.2 *Vaishnaivism*

Vaishnaivism explains that No substance exists other than the Lord, neither the elements, nor karma, nor time, nor prakṛti, nor jīva*. All are His Māyā, assuming form under triguṇa. For the purpose of creation, preservation and destruction through the agency of the five senses, and

their corresponding objects, Lord Vāsudeva presides over the senses. The guṇas bind individual souls with consciousness in the body–mind, all in one. Time is the Lord's māyā disturbing guṇa equilibrium, transforming them. From mahat (cosmic intelligence), time-space emerges (Chaturvedi B.K, 2006)

2.6.1.3 *Kashmiri Saivism*

All Kashmiri Shaivist schools aim at mastering and absorbing time in pure consciousness. The *Svacchananda Tantra* defines time as two fold – solar and spiritual (*saura* and adhyātmika). Time is based on the movement of the astral body; external time is gross (*Sthūla*) while spiritual time is subtle (*Sūkṣma*), and is related to the movement of the vital breath in the body (*Prāṇa*). When movement of the breath stops, time itself ceases and with it, fragmented knowledge – at that moment pure consciousness shines. Time is thus understood as vibrations of consciousness, manifesting in breath. In pure consciousness, time and breath cannot be separated, because in that state the cosmos cannot be separated into macro and micro worlds. The integration of time in consciousness of succession-in-non-succession and vice-versa is the secret of harmony. (Hughes J., 2007) Time cooks and flavors everything, the energy which effects the re-absorption of time in consciousness is called '*Kaala samskarasini*'. (Bettina Baumer, 1999)

2.6.2 Heterodox Traditions

2.6.2.1 *Time in Jainism*:

In Jainism, time is denoted by the word Käla,which is considered a real entity, rather like any other nonliving substance i.e. as a 'substance', it has inherent qualities, like beginningless, eternal, and bringing forth changes i.e. partially responsible for the changes it brings about. Jainism holds that the kāla-chakra (cosmic time wheel) rotates ceaselessly, so that things that are new become old, worn and torn through the ravages of time. All change involves time: past

– present – future are different modes of time measured in terms of year, month, day, hour, minute, second. For practical purposes, the second is the finest measurement of time. (Jain Pushp.line) Time is thus real and measured through compounded changes through sequences of moments exemplified by *Utsar-pani* and *Avsar-pani*, ascending and descending time cycles.

The concept of reality constitutes the universe, where time and space are considered *Ajeeva* or nonliving substance like matter. All activities, changes, and modifications can only be achieved through progress of time. (Hemachandra, 1989)

In Jain metaphysics, *Käla* is considered the last *dravya*, or necessary category of existence, a postulate that it justifies by stating that it is not possible to understand growth and change without the framework of 'real time'. Procesess of change without time would be unintelligible, and would have to be dismissed as illusory. Since, according to Jain metaphysics, the concrete world cannot be dismissed as illusory, time must be considered a necessary condition of change. Time is thus referred to as*käla dhrvya* or category of time, which is contrasted with *vyavahārika käla*, time based on conventions. (Hemachandra, 1989)

Käla dravya consists of movements of *kāla parimana* i.e. a series of instants of time, only related by the concepts of before and after. There can be no simultaneous movements within the time series. In contrast, conventional time is the time we use in our social life, duration being measured by the movements of the sun and moon, with different durations given by different measurements ranging from the shortest (*nimisa*) to the largest (*yuga*).

2.6.2.2 *Time in Buddhism:*

Buddhism does not give Time a permanent or independent existence, nor does it accept time as creator or controller of the universe; nor was time accepted as an entity of cognition; it was only considered a transitory quality of phenomena. The entire phenomenon of mind and matter (*nāma-rūpa*) is processed within the vortex of time, which makes it possible to have creations,

existence, decay, change and death (*marana*). Buddha also considered time relative to states of mind, in some it passes more quickly. Buddhism defines time as measurement of change. It says that time runs only in the mind. In spite of the endless continuum and pervasiveness of time, the Buddhist view is that time is imposed upon the compounded momentariness and changeability of the phenomena of mind and matter. (Rinpoche S., 1996)

2.6.2.3 *Time in Zen Buddhism:*

Zen Buddhism explains, in the actual world, each observer can only experience phenomena as a succession of space and time sections i.e. in a temporal sequence. Mystics on other hand maintain that they can actually experience the full span of space time where time no longer flows. Most believe that, in actual fact, time passes; it stays wherever it is; this idea of passage may be called time. (Zenzi D., 1996)

2.6.2.4 *Time in the Judaeo-Christian Tradition:*

In the Bible, the Book of Ecclesiastes in the Old Testament presents a deep understanding of time which describes the appropriateness of particular times for particular actions: "There is a time for everything, and a season for every activity under the heavens: a time to be born and a time to die; a time to plant and a time to uproot; a time to kill and a time to heal; a time to tear down and a time to build; a time to weep and a time to laugh; a time to mourn and a time to dance; a time to scatter stones and a time to gather them; a time to embrace and a time to refrain from embracing; a time to search and a time to give up; a time to keep and a time to throw away; a time to tear and a time to mend; a time to be silent and a time to speak; a time to love and a time to hate; a time for war and a time for peace.

"God has made everything beautiful in its time. He has also set eternity in the human heart."

This speaks of divisible time (verses 1-8) and indivisible time (verses 10-11) (Bible, 2011), the former referring to physical time where everything happens according to the unfolding of

Nature (*kāla*) and the latter, encompassing all time (*Mahākāla*). The moment you go beyond the rational mind during meditation, into ritual time, you can reach immortal time where pure consciousness pervades, and the unity of knower, process of knowing, and known administers everything.

2.6.2.5 *Time in Islam:*

In the Koran, there is no past or future. For Him time is a single moment. Space and time conceived by us as millions of years long is one moment in Allah's sight. True time has been discussed along with space yet both of them are independent of each other Time as an expression of human existence, is always human time human thought. Time is a cutting sword in hands of man who conquer history and to control it. "Pluto regarded time as unreal", Iqbal says - The world is situated in space – denial of the world means denial of space. (Akhtar V., 1999)

2.7 TIME IN UPAVEDA AND VEDĀṄGA

2.7.1 Āyurveda: The 'Science of Life'

In general, Āyurveda takes its understanding of the philosophy of time from its *Padārtha (*Laxmipathi A., 1973a,b), or philosophical foundations, *Nyaya* (Laxmipathi A., 1973a), *Vaishishika* (Laxmipathi A., 1973a) and *Sāṅkhya* (Laxmipathi A., 1973b), from among the six orthodox systems of Indian Philosophy, the *Ṣaḍ Darśana.*

More specifically, Āyurveda is concerned with how human behavior fits into the demands of time, Ṛtucarya. (Vagbhata, 2010) Charaka Saṁhita describes how the sun draws up unctuousness in *Ādāna kāla*, and sharp rough winds produce increasing roughness in *śiśira*, *vasanta* and *grīṣma*. (Charaka Saṁhita, 1981)

Every kind of environment demands a different life-style in order to minimize strain on the physiology. Each season of the year produces its own kind of environmental influences, so

each season requires a specific set of lifestyle rules to prevent doṣas having a morbid influence on the overall physiology. In this regard, in central India, the year may be divided into six periods of approximately two months, in each of which prevailing weather conditions correspond to a particular season. Physiological resilience is highest in *visarga kāla* (March-April) and lowest in *ādāna kāla* (November-December). Each two month period requires an appropriate lifestyle and dietay regimen. Clearly subperiods when seasons are changing, *ṛtusandhi,* are critical time periods requiring special consideration

2.7.2 *Jyotiṣa Vedāṅga*: the Supreme Intelligence of the Inner Light

2.7.2.1 *Introduction*

Jyotiṣa (Parashara M. 1994) is the sixth of the Vedāṅgas, or limbs of the Veda, the role of which was to ensure that the Vedas were correctly preserved, understood and applied. (Nader A. 2000) It contains the most profound study of the influence of time on events, and was used to ensure that Yagyas were performed at times that would maximize their effects. The entire structure of Vedic culture was designed by its leaders, the *Mahaṛśis*, to aim at spiritual liberation and immortality. The structure of *Jyotiṣa* is centered on the sequence *Dhārma – Artha – Kāma – Mokṣa*, the four types of 12 Houses (Parashara M. 1994 pps. 50-61) viz: 1,5,9 (*dhārma*), then 2,6,10 (*ārtha*), going to 3,7,11 (*kāma*) and 4,8,12 (*mokṣa*). The sequence indicates that natural law (*dhārma*) is structured to bring the soul from physical and material to metaphysical-spiritual experiences, from *kāla* to *Mahākāla*; a journey from matter to non-matter. By gaining fulfillment (*ārtha, kāma*) in this world, the soul can then gain liberation (*Mokṣa*) from it, and go on to find find higher fulfillment. Its concern with growth to *mokṣa* makes *Jyotiṣa* a supreme science. The key to progress on the path to *mokṣa* is energizing the subtle body (s*ukshma sharira*) with the correct color vibrations. The *Jīva* can thus gain the protection of the *Kālapuruṣa* constituted by the 12 Rāśis, Figure 1a, avoiding malefic effects in life, and rise to be established beyond space-

time in *Mahākāla*, the level of the Divine. All souls are under the command of the supreme *puruṣa*, *puruṣottama*, as all recognize as they rise to that level of consciousness (Figure 1b).

2.7.2.2 *Jyotiṣa, Dharma and Light*

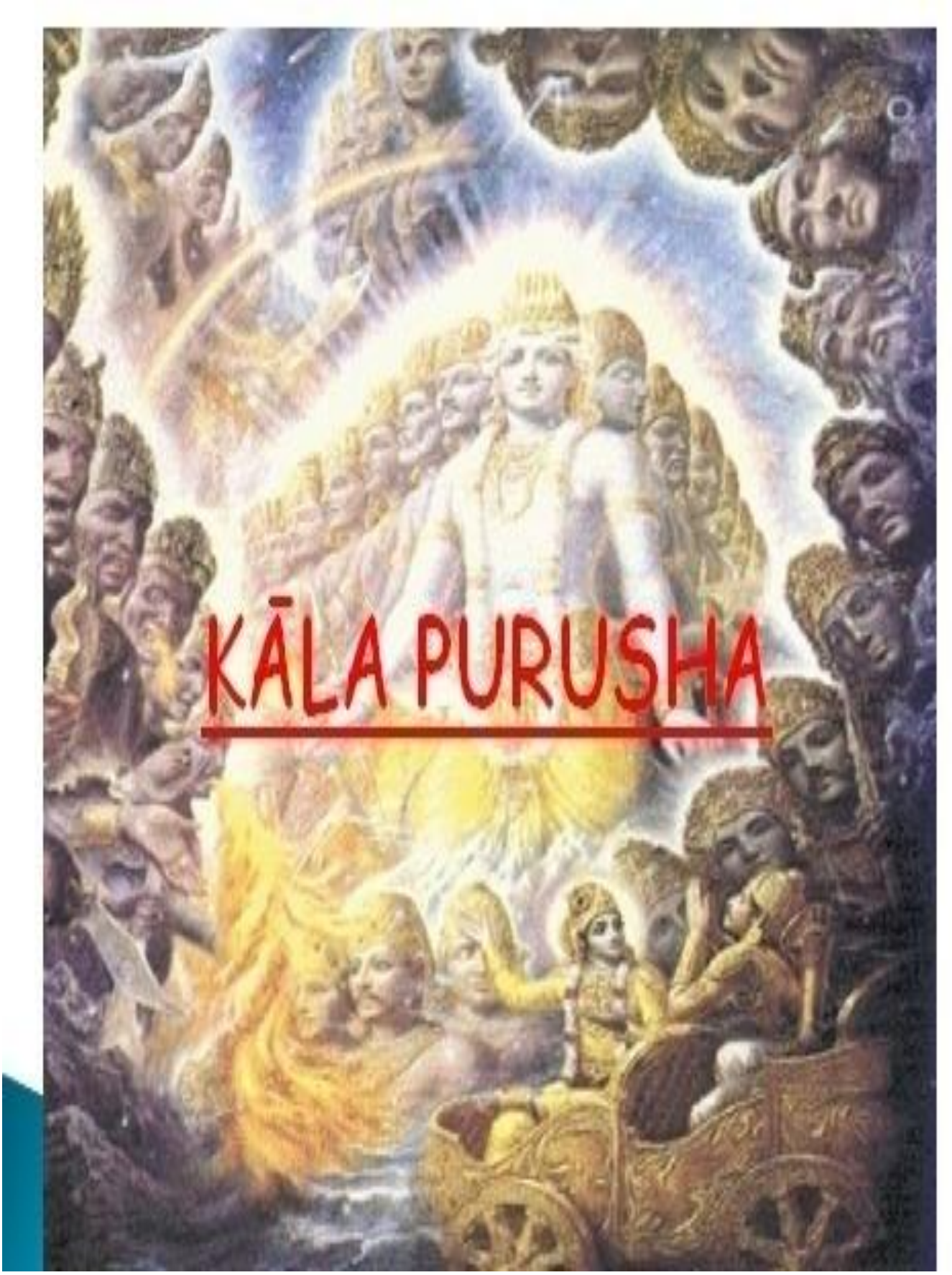
Jyotiṣa regards the whole existence as a singular unit spread over the canvas of space and time, past, present and future. All appearance is manifested from the invisible 'seed force level' to the gross level of the matter world with its own cosmic order. Every individual moves under the influence of 'guiding laws of nature'. (Nader A., 2000) These are transmitted in consonance with the overall structure of natural law, from heavenly mansions revolving round the individual and celestial bodies in orbits round the sun (or earth), and felt as tendencies by human beings in their abode on earth. Astrology is thus a time-space science explaining differences in personality, talents, peculiarities, temperament, likes and dislikes, opportunities and experiences; in short, how the worlds of man and cosmos are coordinated: how the workings of the solar world, situated millions of miles above us, direct variations in body and mind *Prakṛti*, and are thus key to our understanding life on earth.

In *Jyotiṣa*, the medium of light is the measuring tool of time, and movements of all things. Planetary movements are closely correlated with changes in bodily organs and functions. Phases of sun and moon, and corresponding flows of their energies, make particular time periods 'auspicious' or 'inauspicious'; all relate to health. The sun relates to awareness while the moon relates to the mind, creating changes in emotion and mental faculties. The moon in turn conveys qualities analogous to colors from its location to all beings on earth. Each planet is similarly connected to physiology in terms of colors**.** (Rajarao M.B, 1974, p. 226)

PLATE 2a:

***Kālapuruṣa*: the Ideal Human Body formed from the 12 Rāśis (Signs of the Zodiac)**

PLATE 2bThe Vivshwaswarupa: the Lord's Universal Form



2.7.2.3 *The Pañcāṅgas*

Ritual time and *Jyotiṣa* time go hand in hand. Neglecting the former, *Jyotiṣa* time is purely *kāla*, relative time, but in the context of ritual, it is transformed by ritual time into *Mahākāla*, Absolute Time – beyond time. There are five kinds of *Jyotiṣa* time division, the *Pañcāṅgas*, which serve a twofold purpose in ritual time: they schedule religious ceremonies, and they record cosmic events taking into account lunar, solar and stellar situations. These 'five limbs' are: *Tithi* (day in lunar cycle), *Vara* (solar day), *Nakṣatra* (lunar position), *Yoga* (quality of time by sun-moon relationship) and *Karana* (half-lunar day). The *Pañcāṅgas* ascribe strengths and qualities to divisions of time. (Parashara M., 1994, pps. 50-61)

Ritual time-space is specially created for the desired consciousness. Like time, space is of varying quality, diverse and discontinuous. Not all places are suitable for sacred activities, some are more effective than others. A location's effectiveness depends on *vāstu*, associations with Gods, sages, and pitris (ancestral spirits). It can be improved by the power of mantras. Within sacred space, purity space (supreme *sattva*) and protection of that space (*kavaca*) are important components. (Bhaidyanath S, 1996)

2.7.2.4 *Time Divisions of Kāla Puruṣa: the Rāśi time wheel*

When the space domain is divided into twelve divisions as *rāśis* (Parashara M. 1994 pps. 50-61), each is assigned its own *prakṛti* or individual nature, represented by a symbol, animal sign, character traits, emotions, and spiritual patterns, as well as a color, vowel sound, and names. (Sutton K, 1996) Each division is made of strands that include: *guṇa* (Vyāsa V. 1996, XVI) (Frawley D., 2007) (Parashara M, 1994, pps. 640-649) and *Doṣa*. They give time a form, a 'structure in space' endowing each region with different qualities. (Parashara M. 1994 pps. 50-61) They are considered a heavenly body, forming the body of the cosmic '**time person'**, **Kāla Puruṣa** (Figure 2a). In this view, the solar system is a 'time-space machine', mediator of cosmic currents flowing to beings on earth, The sun and moon represent universal clocks, ways

to measure the duration of ritual time. Moon cycles determine its *muhurtas*. Each year contains 12 months, both solar months and lunar months, organized according to the 12 *Rāśi*, or signs of the zodiac. (Parashara M. 1994a)) These form a never-ending cycle like a rolling wheel in terms of which we may imagine them

TABLE 2b. The 12 *Rāśis* and their *Graha* Lords

No	Kālapuruṣa Space Division	Lord of Sign	No	Kālapuruṣa Space Division	Lord of Sign
1	**Aries – *Meesha***	**Mars**	7	**Libra – *Thula***	**Venus**
2	**Taurus – *Vrishabha***	**Venus**	8	**Scorpio – *Vrishchika***	**Mars**
3	**Gemini – *Mithuna***	**Mercury**	9	**Sagittarius – *Dhanu***	**Jupiter**
4	**Cancer – *Kataka***	**Moon**	10	**Capricorn – *Makara***	**Saturn**
5	**Leo – *Simha***	**Sun**	11	**Aquarius – *Kumbha***	**Saturn**
6	**Virgo – *Kanya***	**Mercury**	12	**Pisces – *Meena***	**Jupiter**

FIGURE 2a: The 12 *Rāśis* (Signs of the Zodiac)

The ecliptic divided into 12 equal divisions called *Rāśis* or 'Signs of the Zodiac'

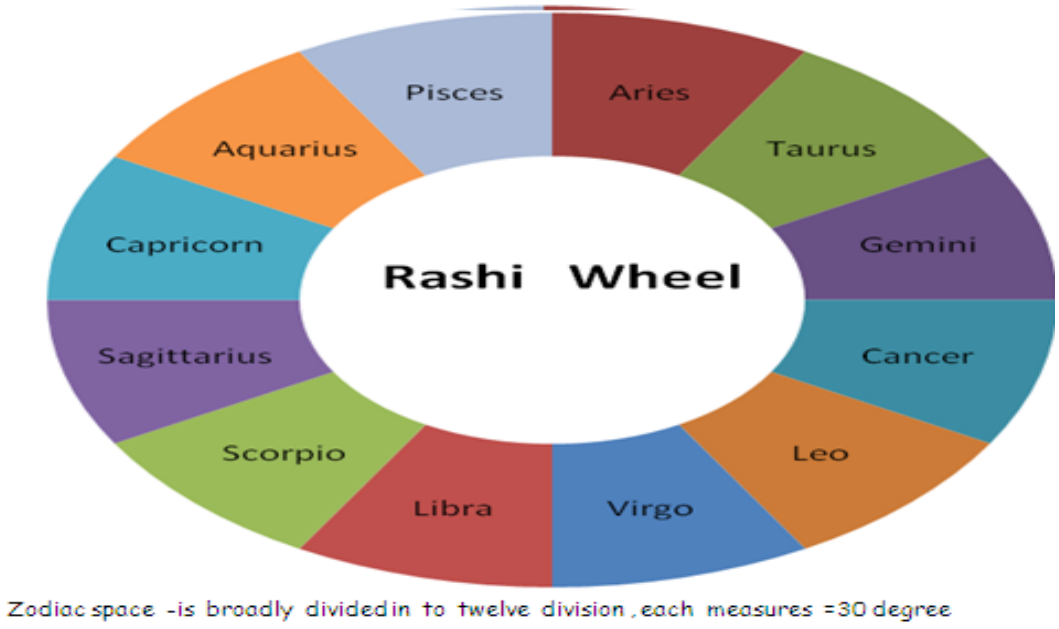


FIGURE 2b: The 12 Signs of the Zodiac with various Vedic principles

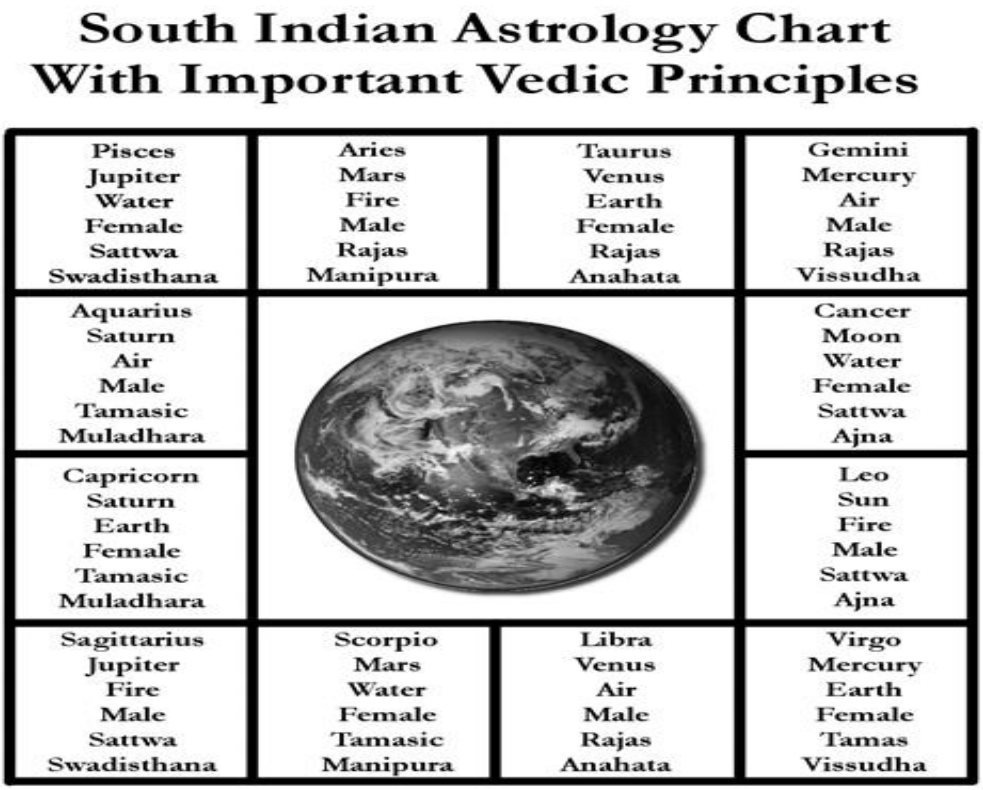


Figure 2b Caption: The ecliptic divided into 12 equal divisions called *Rāśis* or 'Signs of the Zodiac'. Each is assigned its own varied prakṛti or individual nature.

2.7.2.5 The *Nakṣatra* Time *Wheel*

In adition to the 12 signs, *Jyotiṣa* further divides the ecliptic into 27 '*Nakṣatras*' (Sutton K., 1996), each sign containing parts or the whole of three *Nakṣatras*. Table 2b names the 27 *Nakṣatras* (pps. 12-49 in Parashara M., 1994) and their controlling planets in 3 cycles of 9, their order being the same as the sequence of '*dasha*' time periods by which the planets govern a person's life.

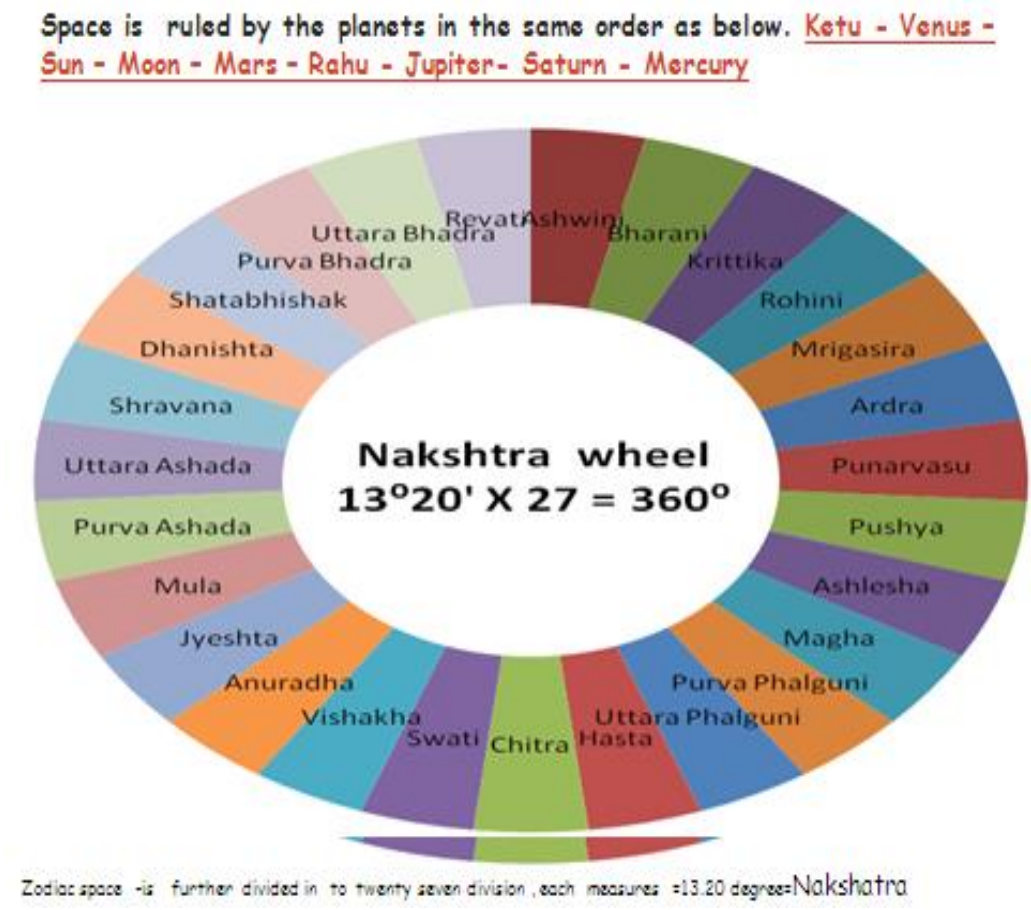
Each Nakṣatra spans a $13^0.\ 20'$ angle of the ecliptic, and is associated with a group of stars. The name usually refers to the brightest star in the group, and from that to the non-decaying current from that ecliptic domain. The 27 Nakṣatras make up a full circle or '*Nakṣatra* wheel' ($13^0.\ 20' \times 27 = 360^0$) – see Figure 2b. . They are associated with the 9 grahas[37] in a set sequence,

***Ketu* – Venus – Sun – Moon – Mars – *Rāhu* – Jupiter – Saturn – Mercury** so that each planet rules over 3 *Nakṣatras*. (Pps. 111-13 in Parashara M., 1994)

TABLE 2c: The 27 *Nakṣatras* according to their *Graha* Lords

Lord	No	Nakṣatra	No	Nakṣatra	No	Nakṣatra
Ketu	1	Ashwini	10	Makka	19	Moola
Venus	2	Bharani	11	Pubba	20	Poorva Ashada
Sun	3	Kritika	12	Uttara	21	Uttara Ashada
Moon	4	Rohini	13	Hasta	22	Shravana
Mars	5	Mrigasira	14	Chitta	23	Dhanista
Rāhu	6	Aridra	15	Swati	24	Shatabhisha
Jupiter	7	Punarvasu	16	Vishaka	25	Poorva Bhadra
Saturn	8	Pushyami	17	Anuradha	26	Uttara Bhadra
Mercury	9	Aslesha	18	Jyeshta	27	Revati

Figure 2c: The *Nakṣatra* Wheel consisting of 27 *Nakṣatras*



2.8 MODERN WESTERN CONCEPTIONS OF TIME

2.8.1 Time in the Western Tradition: Time considered by Immanuel Kant

With regard to time, Kant makes the following major points (Kant I., 1998).

1. To explain relationships between events, mind develops ideas like simultaneity and succession, presupposed in our perception of events. They are "mind-contributed".
2. Time itself is an a priori structure, inherent in our mind without use of empirical data, because we are able to apprehend time by itself, without reference to objects. We can thus define time without reference to objects. In contrast, all objects require the context of time to be defined.
3. Time is a priori, a universal concept, 'measured the same way by all people'; were it a posteriori, there would be "neither strict universality nor apodictic certainty."
4. It is therefore correct to maintain that *Time is experienced within the structure of mind*, rather than being intellectually imposed upon experience by the mind.

Immanuel Kant was one of the greatest and most penetrating philosophers to live in the west. His conclusion that we sense time immediately within our minds, and later apply it as a condition to objects in our surroundings has an important consequence: as the structure of our experiencing mind increases, e.g. our internal coherence and coherence band width increase, our personal perception of time may change e.g. from *kāla* to *Mahākāla*. It is then legitimate to change the way we apply the time concept to the outside world: even our scientific understanding of time may change.

2.8.2 Time in Thermodynamics

In thermodynamics, time is associated with its second law, which says that no irreversible process can take place without an accompanying *increase in entropy*. Reversible processes do not show the impact of time. Popularly known as 'The Arrow of Time', this law is used to establish a reason why time seems asymmetric and goes in one direction, when physics'

underlying laws are symmetric. This law is extended when the concept of information is also introduced. Information is order, whereas entropy is disorder, so the second law is modified to state that as time passes, the difference between the increase in entropy and the increase in entropy must be positive or equal to zero. (Lineweaver C.H., 2013)

2.8.3 Time in Relativity:

H.A. Lorentz pointed out the symmetries of Maxwell's equations, the so-called 'Lorentz Group'. Einstein rediscovered the same group of transformations when he reframed mechanics in a world, in which the speed of light is constant: time is but a dimension of space-time in which time and space can, to a certain extent, be transformed into each other. When two events lie within each other's light cones, one is always prior to the other, buut when they lie mutually outside each other's light cones, there always exists a series of frames of reference in which they are accorded the same value of time – i.e. they are simultaneous. But the relationship between the light cones of two events now takes precedence over the values of time accorded to each event in a given frame of reference, (Born M., 2012)

2.8.4 Time in Quantum Theory

Quantum theory shows that we do not live in an objective, classical world, but one where neither microscopic nor macroscopic levels of reality are strongly objective. All appearances in the macroscopic world arise from the production of information at the quantum level, in processes equivalent to quantum observation. The law of entropy increase in thermodynamics now becomes important, because the overall change in entropy of closed quantum systems must be zero. Second Law increases in entropy observed as events take place at the macroscopic level, and time passes, must be accompanied by corresponding increases in quantum correlations neutralizing those increases in entropy. As classical entropy increases, so does quantum negative entropy: the two are equal and opposite. (Hankey A. 2008)

2.8.5 Biological Time

Time moves in one direction only towards future. Time is irreversible and cyclic, biorhythms make it so. Such biorhythms were recognized in ancient times, and are described in some detail in Āyurveda saṁhitas (Charaka Saṁhita, 1981) (Vagbhata, 2010). An inevitable concomitant consequence of time is change – states of matter and energy continuously change in the passage of time. Reconstruction of history can, therefore, never be total. Example – when we bury a body, after a certain length of time, only bones remain. (Pushpa, 2002) The experiments reported in this thesis transform our understanding of biological time: biological time is not homogeneous.

2.8.6 Psychological Time

The common experience is that time moves forward, we are born, become adult and with the passage of time, are gone. But the psychological aspect is subjectively based. The reverse journey in time is experimentally possible. The objective parameter of this state is statistically valid. The experience and experiment on the subjects reproducible and repeatable. They would therefore qualify to be termed as scientific. It is being subjectively experienced, there is no quantitative measurement. Psychological perception of time occurs because we are in usual states of consciousness. Time awareness is also built in so that most people get up at or around a desired time in the morning. However our awareness of psychological time is based on our consciousness. (Vyas B., 2004(a)

2.8.7 HypnoticTime

Hypnosis results in altered states of consciousness, which may also manifest in meditation. The meditative state is spiritual and mystic, but the hypnotic state is widely researched through scientific tools by psychologists, physiologists and medical doctors. On account of its clinical utility, hypnosis is utilized by medical scientists the world over. So objective criteria are now available for scientific validation of the experiential state.

Time displacement in hypnosis. Displacement in time is objectively demonstrable in hypnosis. The hypnotized subject can be time displaced according to the therapist's suggestions. The most striking and convincing evidence comes in the form of age regression. Age regression is objectively demonstrable back to infancy, meaning the subject actually behaves like the individual at the regressed age. (Revivification happens). Putting it differently, time is so reversed that the person lives in the retro age. Time displacement and age regression can thus be experienced in altered states of consciousness. (Vyas B., 2004(b)

2.8.8 Time's Arrow according to Stephen Hawking

In his book, 'A Brief History of Time', Hawking points out that physics recognis2es three kinds of arrow of time, thermodynamic time associated with entropy increase, cosmological time associated with the expansion of the universe, and psychological time experienced within. Hawking tried to show that physical processes are so intertwined that the three are one. He attributes the arrow of psychological time to increases in memory as experiences of successive events are laid down, and points out that this requires thermodynamic processes, so those two directions of time must be the same. (Hawking, S**, 2009)**

2.8.9 A Summary of Traditions of Time – T.S.Eliot's 'Burnt Norton'

One of the most moving summaries of overall human understanding of time is contained in T.S. Eliot's prose poem, 'Burnt Norton'. The original published in 1936 was expanded into his Nobel Prize winning volume, 'Four Quartets', a modern account of enlightenment in the idiom of his time, established by such luminaries as W.B. Yeats and James Joyce, who also used similar patterns of words and word deconstruction in their symbolic descriptions of enlightenment As the first of the 'Four Quarters', it is North (Norton / northern, where lies 'the still point of the turning world'). Of the four dimensions of space-time, it concerns Time, and how to escape it. Of the 'four elements', it pertains to 'Air', or 'Wind'. Burnt Norton adopts three main approaches to describing spiritual enlightenment. The first, Sections I and II, is in

terms of images of time, and how its divisions of past, present and future can become one wholeness of eternal present i.e. how *kāla* can transform into *Mahākāla*, through the influence of meditation experience, arriving 'at the still point of the turning world', 'where past and future are gathered', and where 'time is conquered'.

The second (Section 3) concerns means of escaping driving forces of desire, describing conflicts and inadequacies experienced in division time, 'time before and time after', the time of the world, commerce and law, 'whirled' by the winds of change; also, the means to psychologically rise above its impact through monastic self-discipline, and the power of meditation to attain 'solitude', where stillness of mind can be established and spiritual peace permanently attained – in *Mahākāla*.

The third (Section 5) concerns the relationship between movement and stillness, illustrated by images from language, music and the world of form. 'Words after speech, reach / Into the silence. Only by the form, the pattern / Can words or music reach / The stillness'; saying of Form, '… as a Chinese jar still / Moves perpetually in its stillness. / Not the stillness of the violin, while the note lasts …', the tone maintaining the tenor of the message throughout, as if to illustrate what the poet claims about the power of the Word, 'to reach into the silence'.

Next comes a discussion of ends and beginnings, establishing a base for the second Quartet, 'East Coker' during which Eliot illustrates the concept of Brahman, 'Or say that the end precedes the beginning, / And the end and the beginning were always there / Before the beginning and after the end.' The same section discusses (1) how time can emerge from the timeless: 'The detail of the pattern is movement', and (2) explains how *sanskaras* drive us into time, 'Desire itself is movement / Not in itself desirable'; of which a transcendental, compassionate Being is both First and Final Cause, 'Love is itself unmoving / Only the cause and end of movement'.

The poem's first lines read: "Time present, and time past / Are both perhaps present in time future, / And time future contained in time past. / If all time is eternally present / All time is unredeemable. / What might have been is an abstraction / Remaining a perpetual possibility / Only in a world of speculation. / What might have been and whathas been /Point to one end, which is always present." Metaphorically these lines cover everything: Mahākāla (Time Present); *Kāla*, with its distinctions of past, present and future; mechanical time – Time Future (Present) in Time Past; Time in Quantum Theory – 'perhaps', 'what might have been'; the entirety of Vedānta is summarized in the three lines, 'What might have been is an abstraction / Remaining a perpetual possibility / Only in a world of speculation', implying that creation occurs under the influence of Agni Devata, as the controller of sight responsible for form (rūpa), i.e. visualized by the creator. Time as a succession of moments (points) with a purpose is symbolically expressed in, 'point (instant?) to (two?) one end (both as in a count-down (?) and with a final cause or purpose(?)); the succession all being contained in Mahākāla – 'which is' (pure being?), always (eternally?) present (Mahākāla as the eternal present?). Here the Joycian puns as appropriate possible implied meanings have been given in parentheses with question marks.

Alternative experiences of time are also described, 'Time before' and 'time after' are used to show how, under anxiety, the succession of moments can cut time into sections.

The whole purpose of life, rising to enlightenment through the transition from *Kāla* to *Mahākāla*, is clearly stated later in the poem: 'Only through time, Time is conquered'. So are the means of achieving this through meditation, 'At the still point of the turning world, there the dance is.' …. 'Were it not for the point, the still point, there would be no dance, and there is only the dance.' Coming to see kāla-within-Mahākāla is expounded as the 'dance' i.e. the dance of Lord Shiva, which keeps the wheels of time turning and the illusion of creation in

motion. (Scofield M., 1988) Overall the structure of the poem symbolizes the descent from Mahākāla into Kāla.

2.8.10 Summary of Time Concepts: Ancient & Modern

The Language of Time: time has been described by different schools of ancient philosophy in two categories (1) divisible time: ongoing physical, relative time, dwelling in the depth of mind, and measurable in terms of seconds, minutes, hours, days, weeks, months, years and centuries, or *tithis*, *vāras*, *pakshas*, *āyanas*, *samvatsāras*, *yūgas*, *kalpas*, *manvantāras*, and (2) Non divisible time: rooted in timeless time characterized by *Akarma–Akrama– Akāla* concerning the absolute.

Time presents a mystery; time is a matrix of all differentiation, the passage between the succession of events; time is awareness, consciousness of past-present-future. Time dwells in the depth of a full mind, moving in one direction only. Time flows always, a moving image of eternity that moves without machine. Our conscious life is embedded in time; time is inseparable from human self; time and space are interpenetrating, time cooks all things, time is the unfailing recorder of everything it is neither merely objective nor purely subjective.

Real time is not possible within the dualistic vision time is not manifested by adhava but-by kriya when time becomes ritual and absolute it speaks of the following terms salvation, liberation, enlightenment, divinization, glorification, *nirvāna*, *mukti*. All are beyond-time - rooted in pure consciousness. In the experiments described below strong evidence was obtained for starting time exerting variable influences on microbial processes. In vaccination, cell culture, and virus propagation processes, starting time exerts non-homogeneous effects, acting as a *heterogeneous* variable. These results contradict every scientific assumption previously made about time, and may therefore seem opposed to the structure of science itself. How subtle influences like those in Vedic sciences may resolve them, will be presented in Chapter 9.

Table 2d: Conceptions of Time, East and West, Old and New – A Summary

Sl #		
2.2	**Vedic Concept of Time** 2 aspects: *Kāla* & *Mahākāla*	Time within Timeless, and Timeless within Time encompass movement of all that exists
2.3	**Ritual Time** Converts *Kāla*➔*Mahākāla*	Man as time-space machine ritually constructed: carries seeds of cosmic harmony
2.4	**Cycles Of Cosmic Time** 3 components: *Srustii Stithi Laya*	Cyclical, never ending process, repetitive and exhaustive. Cosmic cycles like day & night
2.5.1	**Veda Mantra: *Atharva Veda***	AV XIX: 53 & 54 Suktas of incredible beauty and poetry praise Time as Source of Experience
2.5.2 2.5.3	**Brāhmaṇa: *Bṛhadāraṇyaka* & *Māṇḍūkya Upaniṣad***	Anything can be a passage to Timeless Infinity Time is supreme, the Creator of everything
2.5.4	***Ṣaḍ Darśana***	One eternal flow, unbroken continuity, itself indivisible. No space and time without Me
2.5.4.1	***Nyāya-Vaiśeṣika*** **Absolute Time – Relative time**	Time & Space VIBHO, infinite and indivisible. Priority & Sequence, by sun's revolution
2.5.4.2	***Samkya-Yoga***	Time: product of the *Mahat-tattwa* Time and Space are interpenetrating mental constructs..
2.5.4.3	***Vedānta: Vishishta-Advaita*** Indivisible TIME ➔ Divisible time	Time as real entity Eternal insentient entity devoid of Triguna
2.5.6	***Bhagavad- Gītā***	Time is Ishwara: without beginning
2.6.1.1	***Sanātana Dharma***	Time dwells in depth of full mind: real & unreal
2.6.1.2	**Vaishnavism**	No substance other than Lord Vasudeva Time is his own *māya*
2.6.1.3	**Kashmiri Saivism**	Time absorption in consciousness: *Kala samskarasini*
--	**Swami Vivekananda**	In Absolute, neither time, space nor causation
2.6.2.1	**Jainism**	Time is real: Nonliving substance Measured by movements of sun and moon
2.6.2.2	**Buddhism**	Relative to our state of mind- Moments of Time as measures of change
2.6.2.3	**Zen Buddhism**	Sucession of time-space event-moments, Passage of sequence called time
2.6.2.4	**Judaeo-Christian Tradition**	Appropriate Time for each purpose and action
2.6.2.5	**Islamic Time**	Time is a single moment in Allah's sight
2.7.1	***Āyurveda***	Quality of time boosts strength of dravyas, viryas and dosha biorhythms.
2.7.2	***Jyotiṣa*: *Kālapuruṣa* - Phenomenal time Life is a Journey to Absolute-time**	Time Heterogeneous based on Muhurthas Dasha periods Ruled by *Nava Grāhas*
2.8.1.	**Immanuel Kant**	Time innate to subjective experience
2.8.2	**Thermodynamics**	Second Law: disorder gives arrow to time
2.8.3	**Special Relativity**	Space-Time interval is sole invariant for 2 events
2.8.4	**Quantum Theory**	Time results from infinitely correlated information producing 'events'
2.8.5	**Biological Time**	Organism energy production➔ irreversible Time Time heterogeneous.in complexity biology
2.8.6	**Psychological Time**	Subjectively based: in-built awareness of time depends on our consciousness
2.8.7	**Hypnotic Time**	Time displacement in altered states of awareness
2.8.8	**Stephen Hawking**	3 Arrows of Time Thermodynamic, Biological and Cosmological (Red Shift) unified
2.8.9	**T.S. Eliot: 'Burnt Norton'**	Only through time, Time is conquered:

3 SURVEY OF SCIENTIFIC LITERATURE

3.1 INTRODUCTION

The main thrust of this thesis is that ‘starting time effects’ exist in biological processes. A major question is how to explain them. Could they be due to recognized sources of variation? Rates of biological processes are well known to vary on different time scales: daily (Koukkari, 2007a), lunar month (Koukkari, 2007b), and annually (Koukkari, 2007d). Starting time effects in our experiments cannot be due to biorhythms, howeever. Experimental growth perods of multiples of 24 hours, mean that 24 hour averages prevent starting times from affecting output.

3.2 MAIN DISCOVERY AND STOCHASTICITY

Microbiological processes are well recognized to exhibit great variability. Their apparently unpredictable variations offer a great challenge to explain. It has been proposed that most cellular processes are subject to large variations in reaction rates. A classic paper (Elowitz M.B., 2002) found evidence for large variances in rates of protein synthesis. An immediate response (Federoff N and Fontana W, 2002) suggested that the variations are due to the ‘small numbers’ of Big Molecules involved in such reactions. Small numbers have large coefficients of variation (SD / Mean), and might lead to high leels of purely stochastic variability. This theory, known as‘Stochasticity’, has a vulnerable point. Being by definition ***purely random***, a stochastic process’s variations cannot depend on changes in any identifiable variable, certainly not time. ‘Starting time effects’ therefore bring the stochasiticity explanation into question, and point to a need for a new explanation.

3.3 ECLIPSE EFFECTS: EXTREME INAUSPICIOUS STARTING TIMES

Some of our most powerful datasets are those from the four experiments performed on days of eclipses (Chapter 8) observing completely new effects. Many scientific observations on eclipses have been reported, ionospheric (Klobuchar, J.A., 1965), atmospheric (Farges T.,

1999), resulting in noticeable gravitational waves (Zerefos, C.S., 2007); meteorological effects on weather patterns (Anderson J,, 1999); chemical changes in ozone and water pH (Sharma, S.K., 2010a), and hydrological changes (Sharma, S.K., 2010b); panic and other changes in animal behavioral patterns are reported for birds (Elliott, J.A., 1974), fish (Jennings, S., 1998), rodents (Advani, R., 1981) and primates (Branch, J.E., 1986). Even effects on microbes have been noted. (Branch, J.E., 1986) (Ishwaran V., 1981) Such behavioral changes are local to the region of totality. So far no effects have bee observed in regions far from totality. Our Chapter 8 results suggesting globalized starting time effects are without parallel.

3.4 ASTROLOGY JOURNALS AND ASTROLOGY RESEARCH

In the west significant journals in astrology are, in London, 'Correlation: a Journal of Research in Astrology', published by the Astrological Association, reporting work in western astrology (Currey R., 2011) (Ertel S., 1997), and in the United States, the Journal for Scientific Exploration, which is prepared to publish good papers by competent scientists (McGrew J., 1990), including a key one by Professor Suitbert Ertel (Ertel S,, 2009),

In the field of *Jyotiṣa*, the leading journal is the Journal of Astrology published in New Delhi, and edited by *Jyotiṣi* K.N. Rao. (Rao K.N, 2007) Other journals include the Council of Vedic Astrology Journal with connections to AmritanandaMayi Ma's University. Finally, Modern Astrology, dedicated to the highest scientific quality of research article on *Jyotiṣa* at present. *Jyotiṣa* is known as the Eye of the Veda, Chakshu**.** (Rao K.N, 2007a,b,c) None of these has published research of the kind reported here; nothing on pure biology, little if any on muhurtha.

3.5 MEDICAL ASTOROLOGY RESEARCH

The research that can be most closely compared to that reported herein is a recent series of experiments aiming to establish an evidence-base for medical astrology carried out using essentially conventional biomedical protocols by Dr T. Shrilakshmi and a team at Amritananda

Mayi Ma University in Kerala, India, and published in Modern Astrology and CVA journal (Shrilakshmi T, 2011 a-c, 2013 2014a-c).The idea is to use conventional statistical methods to compare frequency of occurrence of afflictions related to particular *grahas* in *janmakundalis* of groups of patients with particular pathologies, with frequency of occurrence of the same afflcitions in control groups. More specifically, an astrological condition leading to a specific disorder is identified from traditional texts, or their modern interpretations, and tested as a ***risk factor*** for the pathology in question. The statistical tests establish low probabilities for the relative frequencies occurring by chance. Study results therefore depend on conventional biomedical criteria for establishing the presence of a risk factor.

In a first study (Shrilakshmi T, 2011a), the condition of affliction of *Surya* (the Sun) by *Ṣāni* (Saturn), was selected as appropriate to test on autoimmune arthritis; it may be justified as follows. *Āyurveda* names the disorder, '*Āma-Vata*', *Āma* being caused by poor digestion, while *Vata doṣa* with *Vayu Mahābhūta* as a component will cause imblance. *Surya*, being Lord of *Vata doṣa*, the 5th house (stomach) of *Kālapuruṣa*, governs *jataragni*, the gastric fire; while *Ṣāni* represents *Vayu*. *Ṣāni* afflicting *Surya* is therefore an appropriate *Jyotiṣa* condition to produce *Āma-Vata* ccording to *Āyurveda*, and is therefore correct as a potential risk factor for autoimmune arthritis.

In a retrospective study (Shrilakshmi T., 2011a), data from 90 patients with autoimmune arthritis was compared with 50 healthy controls. Birth charts were prepared using Parasara software version 7; afflictions to *Surya* by *Ṣāni*, *Rāhu-Ketu* and *Ṣukra* were calculated, and between group comparisons performed using Pearson's chi square test. Statistical significance against the null hypothesis was $p < 0.001$, and the odds ratio was 5.5: people with autoimmune arthritis are 5.5 times more prone to possess afflicted ***Surya*** than those with no affliction.

A second study (Shrilakshmi T., 2011b) analyzed the possible effects of *Ṣāni daṣa* and *antadaṣa* periods on lower limb amputations in 200 Type 2 Diabetes Mellitus patients. It found that 28.5% and 17%, respectively, of such amputees were undergoing these two time periods,.

A third study (Shrilakshmi T., 2011c) concerned connections between 7th house afflictioins and renal failure. It compared 60 patients with end stage renal failure undergoing hemodialysis, with 30 normal controls. Serious permanent and temporary afflictions to both the 7th Lord and 7th house were taken as criteria for the risk factor. Significant association was found ($p < 0.0001$) with odds ratio 15.6 in 95% confidence limits. Patients with end-stage renal failure are 15.6 times more liable to have the said risk factor than healthy controls.

A fourth study (Shrilakshmi T., 2013) hypothesized malefic affects of *Kapha grahas*, *Guru* (Jupiter), *Ṣukra* (Venus), and *Chandra* (Moon), on the 4th house as possible risk factors for Polycystic ovarian syndrome (PCOS). 60 patients diagnosed with PCOS were compared with 30 healthy controls using Chi-square and Fisher Exact tests. Statistical significance was found for afflictions of Jupiter, $p < 0.001$, and Moon, $p = 0.027$, with odds ratios of 11.45 and 5.

A fifth study (Shrilakshmi T., 2014c) examined the combined roles of *Ṣāni* and *Mangal* in asthma using three groups: 30 patients diagnosed with allergic asthma, 30 with unspecified asthma, and 40 healthy controls. Malefic effects of *Ṣāni* and *Mangal* on the ascendant, 3rd house and *Mithuna* (Gemini) were compared using Pearson's chi squared test. For the influence of either or both *Ṣāni* and *Mangal* on the ascendant, statistical significance $p < 0.001$ was obtained; odds ratio 2.718 (CI: 1.723, 4.288). The 3rd house and *Mithuna* also showed significance, but with higher p values.

Taken together, these studies provide high level statistical evidence against the null hypothesis, '*Janmakundali data bears no relationship to future circumstances in a person's life*'. On the contrary it suggests that further studies of other possible risk factors are needed. We therefore

consider the studies' strengths and weaknesses. Their main strength seems to be as a means creating significant data showing that *Jyotiṣa* astrology makes non-trivial predictions.

a. Studies can validly be done on retrospective data.
b. They consist of simple pair-contrasts obeying the 'law of comparative judgment' (Thurstone L.L., 1927).
c. They do not pretend to give accurate predictions, only tendencies.
d. The approach suits systems that consider pathologies to have multiple causes.
e. Failure to observe a correlation does not constitute failure of the approach
f. It applies to people where tendencies for different diseases can be specifically timed
g. The approach is objective, there only 'art' involved, lies in initial determination of the degree of affliction required for each planet concerned, and of possible neutralizing factors, both of which are open to quantitative calculation in *Jyotiṣa*.

Regarding weaknesses of this kind of study: The first is that it depends on statistics, and many scientists would rather see results in black and white, rather than shades of grey. The second weakness is that it only deals with tendencies, and does not absolutely predictive, which most scientists imagine is the true role of science. Neither of these weaknesses is fatal, both can be improved by suitable experimental design in the future, based on further research.

3.6 CURRENT ACADEMIC RESEARCH ON ASTROLOGY

There is currently a resurgence of interest in aspects of astrology among the academic community, and how it was used in earlier times. (Dawson M.S., 2013) Dawson writes powerfully of the use of a form of *prajñā* to identify approximate descriptions of persons who had committed crimes. (Dawson M.S., 2013) He cites relatively recent books, such as: 'The forgotten Sky: a guide to astrology in English literature' (Eade J., 1984), and 'Prophecy and

power: astrology in early Modern England' (Curry P., 1989), and also recounts a reference to the occurrence of a total eclipse in 1679, visible only in the Pacific Ocean: (Coley H, 1679)

3.7 ACADEMIC SKEPTICISM ACTIVE AND PASSIVE

Steven Weinberg, originator of the 'Standard Model' of elementary particle physics, writes that astrology is so unlikely a phenomenon that it is not worth the time and effort to bother to test. (Weinberg S., 1992) This is mild compared to the way that the leading scientific journal, *Nature*, behaved in instigating a dismissal of astrology. Shawn Carlson, an undergraduate at Berkeley wrote a paper, 'A double-blind test of astrology' (Carlson S., 1985), severely questioned by H.J. Eysenck (Eysenck H.J., 1986) who said its psychological scale was 'arbitrary and subjective'. Nor did variables tested relate to those used by astrologers. (Ishwaran V., 1981) Furthermore, it involved three way choice, instead of two as in the 'Law of Comparative Judgment"[91], used in a previous test (Clark V., 1961) that Carlson failed to cite: An astrologer whom Carlson requested to advise on design of the test stated that Carlson had not followed any of his suggestions (Hamilton T.W., 1986), concluding it was not fair. Nevertheless, Carlson's paper was seized on as a sweeping disproof of astrology, and continues to be quoted as its final debunking. In a recent appraisal Ertel (2009) showed that Carlson had failed to identify positive results obtained by the astrologers. Ertel (2009) pointed out that the stated data yielded ES = 0.15, with a p value 0.054 for the three way choice test, and ES = 0.10, with p = 0.037 for correlations on the self-rating scale. (Ertel S, 2009) His results do not constitute a verification of astrology, but Carlson's work cannot be considered a disproof (Ertel S,, 2009): Carlson stacked the cards against his astrologer test subjects (Currey R., 2011) (Eysenck H.J., 1986) (Clark V., 1961) (Hamilton T.W., 1986), and short changed them in the statistical analysis of their results. (Ertel S,, 2009) Ertel claims not to be easily convinced of the validity of a study. (Ertel S., 1996, 1997) For many years, he followed up Gauquelin's work on planetary positions in the birth charts of people in particular professions (Gauquelin

M., 1988), showing that skeptics' positions on it are flawed (Ertel S., 1999), and that it has tenaciously withstood scientific scrutiny by skeptics. (Ertel S., 1996)

Reactions to his appraisal (Ertel S, 2009) reflect personal prejudices. Astrologer Currey's reaction said science had reversed its opinion. (Currey R., 2011) In contrast, the Wikipedia page on Astrology simply lauds Carlson's study, parading a picture of him, and failing to mention any of the criticisms made against it (Currey R., 2011) (Eysenck H.J., 1986) (Clark V., 1961) (Hamilton T.W., 1986) or any of the new findings, (Ertel S, 2009) It fails to approach the scientific question in the dispassionate, open-minded fashion that successful science requires. Professional scientists with unusual views encounter such opinions not infrequently**.** (Ertel S, 2009) (Sheldrake R, 2012) (Ullman D., 2009) (Milgrom L.R, 2008)

3.8 CONCLUSION

The literature reviewed above, and summarized in Table 3d below, reveals intense controversy, indicating that only the strongest and most robust results may hope to be considered. It also suggests that no one has previously conceived of ***Jyotiṣa*** phenomena as *biological* pervading all life. The closest approach to this thesis is the work reviewed in section 3.5. (Shrilakshmi T, 2011 a-c, 2013 2014a-c) In such cases, science considers that *consistent validity of such experiments must imply the existence of new fundamental aspects of physics and biology* that may begin to help explain them.

From this viewpoint the experiments reported in Chapters 5-8 provide *biological* underpinnings for those of 3.5. Their data come from protocols never previously reported in microbiology, although they are based on consdierations similar to those discussed in Section 3.5: take statements from traditional knowledge, and translate them into predictions that are experimentally testable. Lack of previous parallel *biological* experiments in the literature means those of Chapters 5-8 stand on ground completely new to science. They are unique.

Table 3a: SURVEY OF SCIENTIFIC LITERATURE: SUMMARY

Sl No	Particulars	Inference
3.1	Introduction	Main Thrust of Thesis: Starting Time Effect Heterogeneity of Time dimension
3.2	Start time Effects, Stochastic Explanation	Output Variability in Microbe Production Processes Standard Explanation Stochasticity in cell growth processes
3.3	Eclipse Effects:	Reported effects: atmospheric, environmental, behavioral in animals, birds etc. even microbes, all of them local; our experiments suggest global changes to the whole biosphere.
3.4	Astrology Journals And Astrology Research	Journal of Research in Astrology, Vedic Astrology Journal from Amritanandamayi Ma University. Correlation. No comparable research papers to ours have appeared.
3.5	Medical Astrology Research	Closest to compare: the series of papers by Shrilakshmi T. et al 2011-.2014, used group statistics to establish effects. For example: the Role of Mars and Saturn in Asthma
3.6	Current Academic Research On Astrology	Recent resurgence of interest in how astrology was used in earlier times.
3.7	Academic Skepticism Active And Passive	Carlson: 'A Double-Blind Test Of Astrology' Criticized by Eysenck; Ertel's Appraisal: Wrong Conclusion – in fact, the data actually marginally supported astrology.
3.8	Conclusion	Literature review reveals intensity of controversy. Only strongest results acceptable to average scientist Noone else conceives of astrology as biologically-based

Table 3a Caption: Table 3a summarizes the research reviewed in this Chapter. Section 3.5 reviews a few well-conceived, new medical experiments testing ***Jyotiṣa*** *Janmakundali* predictions. Overall, depite work by Carlson discussed in Section 3.7, there is marginal support for astrology. Also, because a scienctific model, which would permit astrology to work, seems impossible to develop, most scientists consider the field null and void, an opinion apparently confirmed by one or two poorly conceived and strongly criticized experiments. To this date, there have been no strong models with robust supporting experiments like those presented here.

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4 AIMS AND OBJECTIVES

4.1 AIMS

To explore effects of starting time on production of microbes of veterinary importance.

4.2 OBJECTIVES

1) To establish the scientific validity of sections of traditional knowledge, and 'decode' them.
2) To scientifically establish the 'heterogeneity of time', and relate to *triguṇa* qualities.
3) To identify specific time factors influencing growth processes in Veterinary microbiology:
    a) PPR vaccination response in sheep and goats *in vivo* (Chapter 5)
    b) BQ bacterial culture *in vitro* (Chapter 6)
    c) HS bacterial culture *in vitro* (Chapter 6)
    d) Raniket virus culturing in chicken embryo cells *in vitro* (Chapter 7)
    e) BT virus culture in BHK21 cell line13 cells *in vitro* (Chapter 7)
    f) Solar eclipse time slots on BT viral growth *in vitro* (Chapter 8), and
    g) on avian REO virus vaccination response *in vivo* (Chapter 8)
4) To show that certain time divisions of *Rāśis, Nakṣatras*, *Rāhukāla* and eclipse times are 'auspicious', and others 'inauspicious'.
5) To identify variables from astromedicine that enhance the quality of life.

4.3 RESEARCH QUESTIONS

1) Whether time of vaccination has an effect on vaccination outcome?
2) Do starting time-slot experiments exhibit systematic variations in vaccine production?
3) Are such variations in production of vaccine real or experimental noise?
4) Are these experiments time dependent or space dependent (or both) in some 'real sense'?
5) Can starting time, and the time dimension in general, be treated as research variables?
6) Do solar eclipse effects extend globally, or are they only local?

4.4 EXPERIMENTAL HYPOTHESES

In all the experiments, the experimental hypothesis was that experimental outcomes for different starting times would produce observable differences in qualitative agreement with predictions of traditional knowledge. Specifically:

1. Vaccination during auspicious *Gurukala*will enhance immune response, whereas the same during an inauspicious time slot like *Rāhukāla*will reduceimmune response and vaccination outcome.
2. Similarly, auspicious and inauspicious times will change output of viral and bacterial vaccine production. Specifically:
    a. Auspicious times will enhance bacterial growth and increase bacterial vaccine production.
    b. Inauspicious starting times will enhance virus propagation and increase viral vaccine production,
3. The **null hypotheses** were the opposite: no differences between batches started at different starting times would be observed – time would be seen to be *homogeneous* – so that, for each experimental type:
    a) Starting time has no effect on vaccination outcome
    b) Starting time has no effect on bacterial vaccine production
    c) Starting time has no effect on virus propagation for viral vaccines.
    d) Solar eclipse effects are only local and not global.
    e) Starting time slots during a solar eclipsewill have no effect on virus propagation.
    f) Starting time slots during a solar eclipsewill notinfluence degree of vaccination uptake.

5 SMALL RUMINANTS VACCINATION EXPERIMENTS

5.1 BACKGROUND

Vaccination is an unpredictable procedure that produces highly variable responses among identical animals in a group. Different animals have immune systems with naturally different responsiveness; other than this, no reasons for such variation are known. Clearly, identifying any cause of such variations that could be controlled, or for which allowance could be made, would lead to improvements in vaccination efficiency. From our understanding of the nature of time in the Vedic tradition, we proposed an investigation of the influence of time on vaccination outcome.

The specific experimental hypothesis that we tested was that differences in outcome depend on process qualities associated with process starting time, specifically that guṇa s (qualities) associated with *kāla*, and which vary with the passage of time, would influence process outcome. As we have seen, the idea that time is not homogeneous, but assumes different qualities at different times, pervaded the ancient Vedic culture, and all ancient traditions, being most specifically elucidated in *Maharṣi Kapila*'s system of *Sāṅkhya* philosophy from *Ṣaḍ Darśana*, which states that *kāla* only manifests out of *Mahākāla* when driven by the three *guṇas*, *sattva*, *rajas* and *tamas*, which, as a result, naturally associate with each instant of experienced time.

Jyotiṣa makes firm predictions of outcome success for actions performed at each time. In *Jyotiṣa*, the concept of starting time is known as '*muhūrta'*. (Shriram D.A, 1996) A series of five independent tests of *Jyotiṣa* predictions on groups of small ruminants vaccinated against PPR virus were conducted at'auspicious' and 'inauspicious'times. The first three compared response to vaccination performed under two rising signs, auspicious *Dhanu* (Sagittarius) and inauspicious *Makara* (Capricorn). The last two used a very inauspicious time, *Rāhukāla*

(Trimedi P, 2005), briefly explained in Appendix B. As far as can be told, the experiments are the first to test scientific predictions of *Jyotiṣa* astrology on *purely biological* processes. They represent tests of different starting time effects carefully selected to produce strongly positive or strongly negative results.

5.2 STUDY DESIGN

The experiments tested specific predictions of relative levels of immune response in groups of small ruminants vaccinated against peste des petits ruminants (PPR) virus under three conditions, one 'auspicious' and two 'inauspicious'. The study design was pre-post, conducted over 21 days with controls. Three groups of 8 month old, female, previously unvaccinated, small ruminants were vaccinated on two farms in Karnataka State. 1. 40 goats, 2. 41 + 23 sheep, 3. 13 + 12 sheep. Each group had a corresponding group of unvaccinated controls: 1. 6 goats, 2. 12 + 11 sheep, and 3. 12 more sheep, totaling 145 animals tested in all. Blood samples were analyzed by OIE standard c-ELISA tests. Three experiments compared auspicious and inauspicious *l̤agnas*; two compared very inauspicious *Rāhukāla* time with averages of non-*Rāhukāla* times as controls. See Appendix A1 for details of methods.

5.3 RESULTS:

All the raw data is given in Appendix C. Data presented in this Chapter is after analysis.

Table 5a: Timings of Goat Experiment

Goats PPR Vaccination 02.12.2007: Experimental Design					
Breed & Age	**Groups**	**Vaccinated Time Slot**	**Number of Goats**	**Time of Vaccination**	**Serum Samples Collected**
Osmanabadi-goats7-8mos old	Group1	Auspicious Time	20	7.52am 9.40am	Days 0 & 21
	Group 2	Inauspicious Time	20	9.40am 10.40am	Days 0 & 21
	Group-3	No Vaccination	6	Control	Days 0 & 21

Table 5a Caption: Tabe 5a presents numbers of goats vaccinated under time slots stated.

5.3.1 *Lagna* Experiments:

First experiments, performed in 2007, compared two *Lagna*s: For the Goats, 20 animals were vaccinated under *Dhanu*, 20 under *Makara*, while 6 unvaccinated controls (Appendix-C) were also tested (Table 5a). The number of successful vaccination uptakes and failures for these three groups are given in Table 5b.

Table 5b: Number of Goat Vaccination Uptakes and Failures

Goats	Total	Yes (success) (no: of uptakes)	No (failure) (not well responded)	p Values
Group-1 (Auspicious)	20	**12**	**8**	**FE**2-tailed 0.2049 **FE**1-tailed 0.1025
Group-2 (Inauspicious)	20	**7**	**13**	
Group-3 (Control)	6	0	6	

Table 5b Caption: Tabe 5b presents numbers of goat vaccination uptakes and failures as assessed on Day 21

In Table 5b, the data fall into the Contingency Table shown, so. Fisher's Exact Test is applied. The numbers suggest better results when vaccinating goats under *Dhanu*r (almost twice as successful) than under *Makara*: p values only show a weak trend, however, and only for the 1-tailed Fisher's Exact test. More data (given below) is needed

Figure 5a: Successful PPR Vaccination Response – Goats

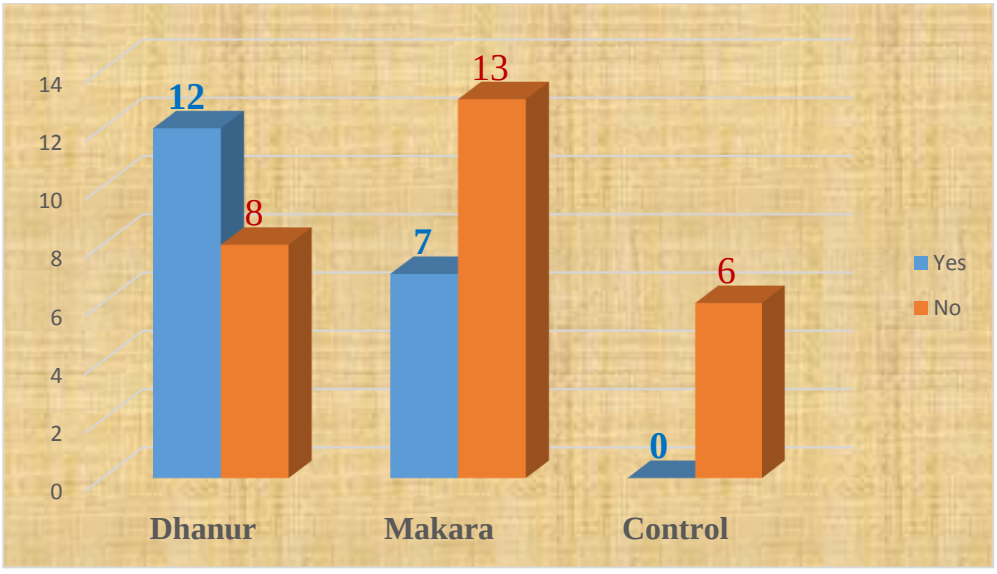

Figure 5a Caption: Figure 5a presents comparative results of vaccination uptake and failure for vaccinations performed under the two different time slots, *Dhanu*r Lagna and *Makara* Lagna

For sheep vaccinated the same day, results were similar and are given in Tables 5c and 5d.

Table 5c: Timings of Chellekere Sheep Experiment

Sheep PPR Vaccination 02.12.2007: Experimental Design					
Breed & Age	**Groups**	**Vaccinated Time Slot**	**Numbers of Sheep**	**Time of Vaccination**	**Serum Samples Collected**
Ram x Deccani Sheep7-8 mos old	Group1	Auspicious Time	21	7.52am 9.40am	Days 0 & 21
	Group 2	Inauspicious Time	20	9.40am 10.40am	Days 0 & 21
	Group-3	No Vaccination	12	Control	Days 0 & 21

Table 5c Caption: Tabe 5c presents numbers of sheep vaccinated under time slots stated

Table 5d: Number of Sheep Vaccination Uptakes and Failures

Goats	**Total**	**Yes (success) (no: of uptakes)**	**No (failure) (not well responded)**	**p Values**
Group-1 (Auspicious)	21	**13**	**8**	**FE**2-tailed 0.1215 **FE**1-tailed 0.0789
Group-2 (Inauspicious)	20	**7**	**13**	
Group-3 (Control)	12	0	12	

Table 5d Caption: Tabe 5d presents numbers of sheep vaccination uptakes and failures as assessed on Day 21.

Figure 5b: Sheep PPR Vaccination Responses under two *Ḻagna*s

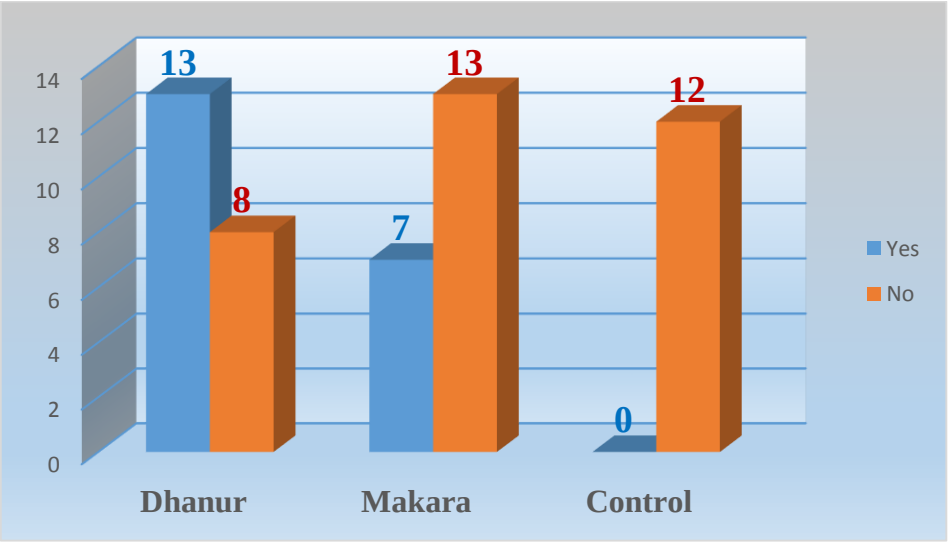

Figure 5b Caption: Figure 5b presents comparative results of vaccination uptake and failure for vaccinations performed under the two different time slots, *Dhanur Ḻagna* and *Makara Ḻagna*

Trends look similar, a single extra sheep made a big difference to the p values. The weak trend is now stronger. It is therefore worth combining results for the sheep with those for the goats, and analyzing both together.

Table 5e: Chellekere Sheep and Goats Vaccination Uptakes and Failures

Sheep & Goats	Total	Yes (success) (No. of uptakes)	No (not well responded)	p values
Group1 (Auspicious)	41	**25**	**16**	**FE**2-tailed 0.0268 **FE**1-tailed 0.0168
Group-2 (Inauspicious)	40	**14**	**26**	
Group-3 (Control)	18	0	18	

Table 5e Caption: Tabe 5e presents numbers of vaccination uptakes and failures as assessed on Day 21.

Table 5e, combining Tables 5b and 5d shows that the consistency between the tables has resulted in the combined figures being statistically significant for both 1- and 2- tailed Fisher's Exact tests; p values suggest:

(1) Systematic differences exist between the two times – the 2-tailed test, $p < 0.0268$ indicates this.

(2) The hypothesis, "An auspicious *Lagna* will lead to better vaccination uptake than an inauspicious one", was supported – the null hypothesis was rejected at $p = 0.0168$.

Table 5f: Timings of Dhangur Sheep Experiment

Sheep PPR Vaccination 19.09.2008: Experimental Design					
Breed & Age	**Groups**	**Vaccinated Time Slot**	**Numbers of Sheep**	**Time of Vaccination**	**Serum Samples Collected**
Bannur Sheep **7-8 months old**	Group1	Auspicious Time	13	12.45 pm 1.01 pm	Days 0 & 21
	Group 2	Inauspicious Time	10	3.03 pm 3.19 pm	Days 0 & 21
	Group-3	No Vaccination	11	Control	Days 0 & 21

Tabble 5f Capteion: Table 5f presents numbers of sheep vaccinated under time slots stated

These results, being individually inconclusive yet together strongly suggestive, led to more data being collected, to see if the emerging trends would continue. The following summer,

smaller numbers of sheep of a different breed were vaccinated at Dhangur farm in Mandya district. *Rāhukāla*, a starting time far more inauspicious than *Makara Ḻagna*, was also tested. Timings are given in Table 5f; results are set out in Table 5g.

Table 5g: Dhangur Sheep Vaccination Uptakes and Failures

Sheep	**Total**	**Yes (success) (No: of uptakes)**	**No (failure) (not well responded)**	**p Values**
Group1 (Auspicious)	10	**6**	**4**	**FE**2-tailed 0.0393 **FE**1-tailed 0.0367
Group-2 (Inauspicious)	13	**2**	**11**	
Group-3 (Control)	11	0	11	

Table 5g Caption: Tabe 5g presents numbers of sheep vaccination uptakes and failures as assessed on Day 21

In Table 5g, figures are dominated by the low percentage of successful vaccinations under *Makara Ḻagna*, only 2 out of 13 (15.4%). Hence the levels of statistical significance in this small experiment, support both hypotheses. It is therefore instructive to combine these results with the others (Tables 5h 5j).

Table 5h: Dhangur and Chellekere Sheep Vaccination Uptakes and Failures

Sheep	**Total**	**Yes (success) (No: of uptakes)**	**No (failure) (not well responded)**	**Contingency Table FE Test p Values**
Group1 (Auspicious)	31	**19**	**12**	**FE**2-tailed 0.0111 **FE**1-tailed 0.0061
Group-2 (Inauspicious)	33	**9**	**24**	
Group-3 (Control)	23	0	23	

Table 5h Caption: Tabe 5h presents numbers of vaccination uptakes and failures as assessed on Day 21 for sheep of both breeds vaccinated on both farms in both experiments. The numbers now reach good significance.

Table 5j: All Sheep & Goat Vaccination Uptakes and Failures

Sheep	Total	Yes (success) (No: of uptakes)	No (failure) (not well responded)	Contingency Table FE Test p Values
Group1 (Auspicious)	51	**31**	**20**	**FE**2-tailed 0.0029 **FE**1-tailed 0.0019
Group-2 (Inauspicious)	53	**16**	**37**	
Group-3 (Control)	29	0	29	

Table 5j Caption: Tabe 5j presents numbers of vaccination uptakes and failures as assessed on Day 21 for all sheep and goats vaccinated on both farms in all experiments. Significance attained is now excellent.

Table 5h presents comparisons of two *Lagna* times for all the sheep on both farms. Good statistical significance is achieved. This is amplified by including the Goats: Table 5j presents results for all small ruminants on both farms, see also the bar graph displayed in Figure 5c. The statistical significances further improve: against no effect being present, to **p** = 0.0029, and against no difference between 'auspicious' and 'inauspicious' times, to.**p** = 0.0019.

Figure 5c: Sheep & Goat PPR Vaccination Response under two *Lagna*s

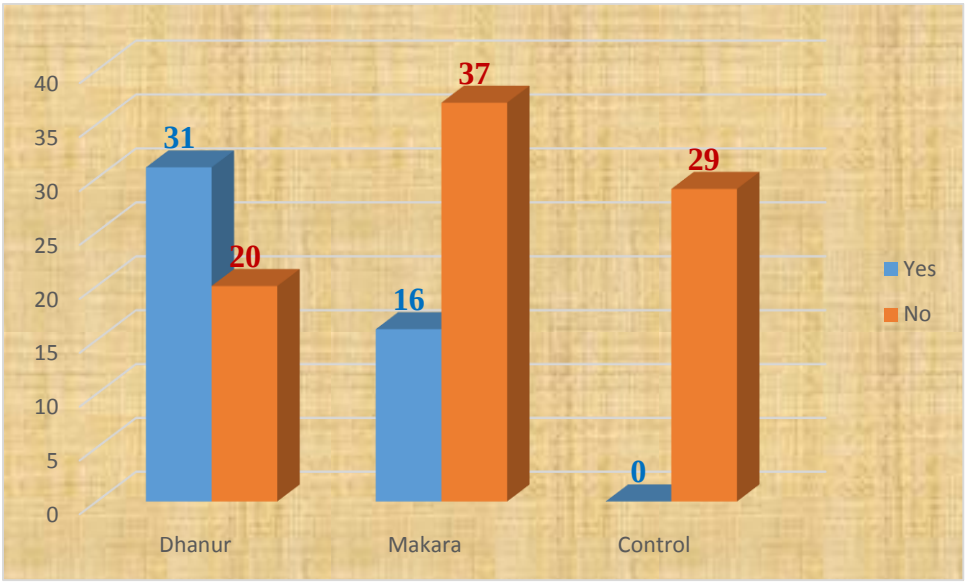

Figure 5c: The percent success under *Dhanur Lagna* (60.8%) is about twice that under *Makara Lagna* (30.2%); the two starting times produce very different results, for all three kinds of small ruminant, 2 sheep and 1 goat.

The three experiments suggest that effect sizes are substantial. Data support the hypothesis that a genuine effect is being observed, **p** = 0.0029, 2-tailed FET; and the hypothesis that auspicious times produce better results than inauspicious times, **p** = 0.0019, 1-tailed FET.

5.3.2 Rāhukāla Experiments

Rāhukāla (Trimedi, 2005) Experiments – A similar study design was used on the two kinds of sheep, but this time no goats were vaccinated. Figures from the same breed of animal, averaged over both *Lagna*s, were used as control data. (Appendix-C) For the Chellekere Sheep, results are laid out in Tables 5k and 5L, which display decisive results: the number of successful vaccination uptakes during Rāhukāla was zero in both groups, 12 and 13 animals. Statistics are clearly significant. The first test to perform on the contingency table is a 2-Tailed Fisher's Exact Test (FET), because, like an ANOVA, it answers the question: "What is the probability that the two sets of results come from the same underlying distribution." A small probability justifies the assumption that the two probability distributions *are* different. Then, as for a 't' test following an ANOVA, a more powerful test can be applied.

Table 5k: Chellekere *Rāhukāla* Vaccination Uptakes and Failures

Sheep	Total	Yes (success) (No: of uptakes)	No (failure) (not well responded)	p Values
Group1 (Rāhukāla)	12	**0**	**12**	**Contingency Table** **FE**2-tailed 0.0017 **FE**1-tailed 0.0013 **Binomial Test** $3.26 \times 10^{-4} = 0.0003$
Group-2 (Vac Control)	41	**20**	**21**	
Group-3 (Control)	12	0	12	

Table 5k Caption: Tabe 5k presents numbers of sheep vaccination uptakes and failures for sheep vaccinated under *Rāhukāla* at Chelleker Farm as assessed on Day 21

Table 5L: Dhangur *Rāhukāla* Vaccination Uptakes and Failures

Sheep	Total	Yes (success) (No: of uptakes)	No (failure) (not well responded)	p Values
Group1 (Rāhukāla)	13	**0**	**13**	**Contingency Table** **FE**2-tailed 0.0820 **FE**1-tailed 0.0445 **Binomial Test** $3.86 \times 10^{-3} = 0.0039$
Group-2 (Vac Control)	23	**8**	**15**	
Group-3 (Control)	11	0	11	

Table 5L Caption: Tabe 5L presents numbers of sheep vaccination uptakes and failures for sheep vaccinated under *Rāhukāla* at Dhangur Farm as assessed on Day 21

Table 5m: Chellekere & Dhangur *Rāhukāla* Vaccination Uptakes and Failures

Sheep	Total	Yes (success) (No: of uptakes)	No (failure) (not well responded)	p Values
Group-1 (Rāhukāla)	25	**0**	**25**	**Contingency Table** **FE**2-tailed 0.00003 **FE**1-tailed 0.00002 **Binomial Test** **p** = 5.66 x 10^{-7}
Group-2 (Vac Control)	72	**28**	**36**	
Group-3 (Control)	23	**0**	**11**	

Table 5m Caption: Tabe 5m presents numbers of sheep vaccination uptakes and failures for sheep vaccinated under *Rāhukāla* at both Chelleker and Dhangur Farms as assessed on Day 21

The 2-Tailed FET tests yield decisive results **p** = 0.0017 and 0.00003 on the Chellekere and combined data, but only a trend, **p** = 0.082 for the Dhangur data, because of the poor 2:11 ratio of success to failure under *Makara l̤agna*, that led to the overall 8:15 ratio in Table 5L. Nevertheless, this seems sufficient to justify the assumption for the next test: the data are from different distributions. Then a Binomial Test can be applied, estimating the probability **p** that the *Rāhukāla* data have arisen from control data by chance: $\mathbf{p} = (1 - \mathbf{f})^{\mathbf{n}}$, where **f** is the ratio of success to total controls, and **n** is the number in the *Rāhukāla* group. This is tiny in all cases. For the combined data, **f** = (28/64) = 0.4375, and n = 25, yielding **p** = 5.66 x 10^{-7}, less than one in a million, decisively rejecting the null hypothesis that *Rāhukāla* has no effect.

Figure 5d: All Sheep *Rāhukāla* PPR Vaccination Response

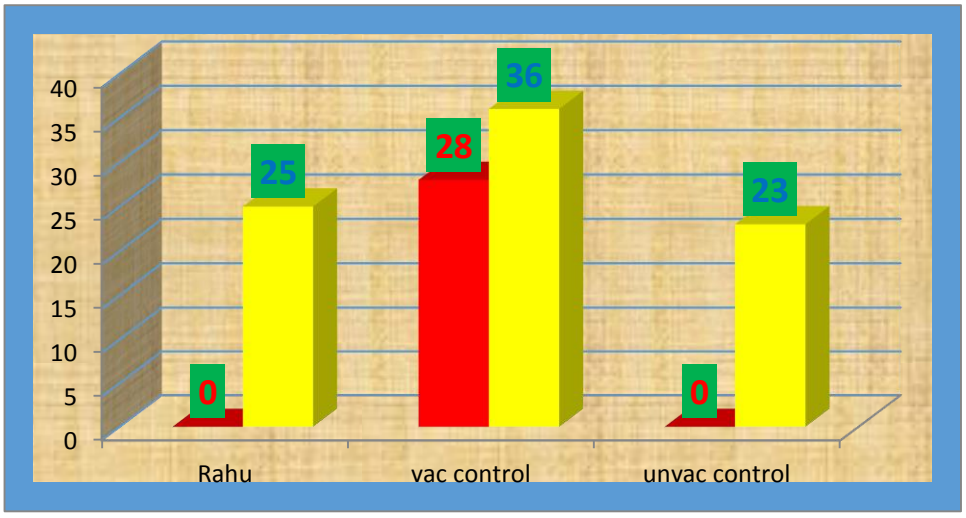

Figure 5d: Comparative results of vaccinations performed under *Rāhukāla* and normal timeslots

For this data, Fisher's Exact Tests are far less than 0.0001: estimates 0.00003, 2-tailed, and 0.00002, 1-tailed. The binomial test yielded $\mathbf{p} < 10^{-6}$: such **p**-values cannot reasonably be expected to occur by chance. *Rāhukāla* starting times can evidently exert a decisive influence on PPR vaccination of Sheep.

5.4 STATISTICAL ANALYSIS OF THE c-ELISA DATA

The use of the 0.35 / 0.40 cutoff values by c-ELISA test kits obscures actual improvements in immune response to PPR vaccine indicated by the raw data. In order to obtain a more precise evaluation of differences between standard vaccination and that done during *Rāhukāla*, we analyze the raw OD data from the c-ELISA test kit analysis given in Appendix C, see also Table 5n, which presents the analysis of the *Rāhukāla* data.

Table 5n shows that, compared to unvaccinated controls, animals vaccinated during *Rāhukāla* did improve in immune response: Chellekere group, t = 5.62, **p** < 0.0001; Dhangur group **t** = 3.35, **p** = 0.0027. But their respective means changed only by 48.6% and 27.2% of the required amount for 50% successful vaccine uptake, about half that of their corresponding vaccinated controls. As a result no *Rāhukāla* vaccinated animal had sufficient immune response to be considered safely vaccinated against PPR: hence the zero scores in Tables 5k, 5L, & 5m.

Table 5n: Immune Response to Vaccination
***Rāhukāla* and Controls OD Values**

FARM	GROUP	DAY 0	DAY 21	't' VALUE	p VALUE
Chellekere	**Ram x Deccani**	**Mean ± SD**	**Mean ± SD**	**Day 0 – Day 21**	**Day 0 – Day 21**
19/09/2008	12 Rāhukāla	0.75 ± 0.052	0.58 ± 0.091	5.62	< 0.0001
19/09/2008	12 Unvacc. Cont'ls	0.67 ± 0.111	0.67 ± 0.089	0.00	1.00
02/12/2007	41 Vacc. Controls	0.53 ± 0.080	0.36 ± 0.120	7.55	< 0.0001
02/12/2007	12 Unvacc. Cont'ls	0.51 ± 0.079	0.52 ± 0.081	0.01	0.99
Dhangur	**Bannur**	**Mean ± SD**	**Mean ± SD**	**Day 0 – Day 21**	**Day 0 – Day 21**
20/09/2008	13 Rāhukāla	0.709 ± 0.052	0.625 ± 0.074	3.35	0.0027
19/09/2008	23 Vacc. Controls	0.763 ± 0.074	0.56 ± 0.160	5.55	< 0.0001
19/09/2008	11 Unvacc. Cont'ls	0.73 ± 0.090	0.64 ± 0.065	2.69	0.0141

Table 5n Caption: Table 5n gives the immune response as measured by change in OD values for different experimental groups. The two c-ELISA test kits had successful uptake values of 0.35 (2007) & 0.40 (2008)

The Chellekere data in particular have limited comparability. Note that the OD values of both vaccinated controls and *Rāhukāla* changed significantly. The mean of the 41 vaccinated controls was almost reduced to the successful uptake value of 0.35, but Chellekere's*Rāhukāla* group moved less than 50% of the way to their test kits' successful uptake value of 0.40. The mean of Chellekere's unvaccinated controls hardly changed, while the p value for the anomalous shift in Dhangur's unvaccinated controls is well above the significance value of 0.00714 (= 0.05 / 7) allowing for the Bon Ferroni correction. The mean of the Dhangur *Rāhukāla* group only moved 27% of the way to 0.40, while Dhangur's vaccinated controls moved 55.6% of the way. The data thus quantify the inhibition of vaccine uptake for *Rāhukāla* starting times.

The c-ELISA data for the comparison of the two rising signs given in Appendix C is summarized and analyzed in Table 5p, giving means, standard deviations, and t and p values.

Table 5p: Immune Response to Vaccination
***Dhanur & Makara Ḻagnas* and Controls OD Values**

FARM	**GROUP**	**DAY 0**	**DAY 21**	**CHANGE (%)**	**p VALUE**
Chellekere	**Ram x Deccani**	**Mean ± SD**	**Mean ± SD**	**Day 0 – Day 21**	**Day 0 – Day 21**
02/12/2007	21 *Dhanu*	0.556 ± 0.06	0.352 ± 0.12	- 36.7%	< 0.0001
02/12/2007	20 *Makara*	0.493 ± 0.05	0.397 ± 0.05	- 19.5%	0.008
02/12/2007	12 Unvacc. Cont'ls	0.67 ± 0.111	0.67 ± 0.089	**Betw'n Groups**	**p** = 0.001
Chellkere	**Goats**	**Mean ± SD**	**Mean ± SD**	**Day 0 – Day 21**	**Day 0 – Day 21**
02/12/2007	20 *Dhanu*	0.585 ± 0.07	0.330 ± 0.13	- 33.6%	< 0.0001
02/12/2007	20 *Makara*	0.474 ± 0.05	0.393 ± 0.11	- 17.1%	0.006
02/12/2007	6 Unvacc. Cont'ls	0.48 ± 0.10	0.47 ± 0.08	**Betw'n Groups**	**p** = 0.018
Dhangur	**Bannur Sheep**	**Mean ± SD**	**Mean ± SD**	**Day 0 – Day 21**	**Day 0 – Day 21**
20/09/2008	10 *Dhanu*	0.772 ± 0.071	0.486 ± 0.177	- 37.0%	0.0027
20/09/2008	13 *Makara*	0.734 ± 0.086	0.596 ± 0.112	- 18.8%	0.0027
19/09/2008	11 Unvacc. Cont'ls	0.708 ± 0.073	0.710 ± 0.065	**Betw'n Groups**	$\mathbf{p}_1$ = 0.041
				One-tailed	$\mathbf{p}_2$ = 0.0207

Table 5p Caption: Table 5p gives the immune response as measured by change in OD values for *Dhanu* and *Makara Ḻagna* groups. The two c-ELISA test kits had successful uptake values of 0.35 (2007), and 0.40, (2008). *Dhanur Ḻagna* group means reduced by almost twice the percent reduction of those for *Makara Ḻagna*.

Table 5p gives the mean and standard deviations for Day 1 and Day 21 for all three classes of small ruminant – Chellekere sheep, Chellekere goats and Dhangur sheep, and all three classes

of group for the animals concerned, *Dhanu* and *Makara L̲agna*s, and unvaccinated controls. The latter, as expected, showed little or no change, effectively zero shift in mean. Means of all other groups changed significantly: vaccination in either time period produced measurable differences in immune response. Shifts in OD values were systematically different for the two groups. When percentage changes in mean OD value are calculated, mean change for *Makara L̲agna* groups is consistently about half that for the corresponding *Dhanu L̲agna* groups – 53%, 51% and 51%. Starting times during *Makara L̲agna* limit immune response to about 50% of that during *Dhanu L̲agna* starting times.

This observation suggests performing an analysis of Day 0 – Day 21 percentage changes in OD values for all 104 vaccinated animals – 51 under *Dhanu L̲agna* and 53 under *Makara L̲agna*. Results of this analysis are: *Dhanu L̲agna* percent decreases are 39.75 ± 21.44%, *Makara L̲agna* percent decreases are 18.65 ± 22.40%; these yield 't' = 4.904, **p** = 2 x 10^{-6}, a level of significance leaving little doubt that different starting times make a big difference in result.

The data thus indicates strong inhibition of immune response for *Makara L̲agna* compared to *Dhanu L̲agna* starting times. The unvaccinated controls hardly changed in OD values for all groups. The data quantify inhibition of vaccine uptake for *Makara L̲agna* starting times.

5.5 CONCLUSIONS:

These vaccination experiments tested two different kinds of prediction: comparison of two starting time slots; and that a 'highly inauspicious time' would have an even greater negative influence than a mildly inauspicious time. Overall, the first three experiments grouped together set excellent statistical significance against the null hypothesis, **p** = 0.0029 for their contingency table, and **p** = 2 x 10^{-6} for the t test comparing reduction percentages in their raw c-ELISA OD data. Similarly the last two experiments, comparing vaccination during Rāhukāla and non-Rāhukāla times for sheep of two breeds, yielded **p** = 0.00003 for the contingency table

calculated conservatively, and **p** = 5.66 x 10^{-7} for the corresponding binomial test, while analysis of the raw optical density data again finds that response to vaccination during Rāhukāla limits the changes in c-ELISA optical density measures of immune response to about 50% of those of vaccinated controls, when measured in terms of the % changes required to meet achieve full protection.

Both combined sets of results (Experiments 1-3 and 4 & 5) therefore strongly support this thesis's hypotheses:

1. Choice of *starting time* can influence outcomes of biological processes.
2. In this context the ancient Vedic concepts of '*auspicious*' and '*inauspicious*' qualities of time can be given scientific meaning: *auspicious* times improve vaccination uptake, *inauspicious* times decrease it.
3. *Jyotiṣa* astrology can be used to make valid predictions concerning purely biological processes.

The final conclusions are: (a) The experiments strongly imply that these concepts apply to vaccination of small ruminants. (b) Vaccination programs should take this into account, if necessary after further testing. (c) The idea that starting time influences immune response requires further exploration, especially on humans, so that times of severely limed immune response can be avoided, and greater efficiency of vaccination programs achieved.

6 BACTERIAL VACCINE PRODUCTION EXPERIMENTS

6.1 INTRODUCTION

Two series of experiments were performed by making observations of bacterial vaccine production runs, the first on Black Quarter (*C. Chauvoie*) vaccine, and the second on Hemorrhagic Septicemia (*P. Multocida*) vaccine. Both experiments started production runs at five different times, including times held to be auspicious and inauspicious. The first was conducted on 8 days, the second on 7 days. Both sets of production runs were conducted according to standard protocols (Merck, 2012) (Shrivastava G.K., 2010). Appendices A2/A3.

In BQ vaccine production, Cell Mass Index (CMI), Nephlometric Turbidity (NTU), Opacity and Sporulation data were measured, while for HS vaccine production, just the first two: both experiments obtained multiple datasets. CMI and NTU data sets were analyzed by 2-Factor ANOVAs – one factor being days, the other times of the day. Their results were significant, permitting between columns t tests to be performed. The datasets were then normalized by subtracting respective means and dividing by their respective overall standard deviations. 2-Factor MANOVAs, Tables 6e & 6h, were then performed on the combined results.

6.2. BLACK QUARTER VACCINE PRODUCTION

The first bacterial growth experiment used standard runs of Black Quarter vaccine production for 5 different starting times, on 8 days between 12th October and 28th October, 2011. Growth time for each batch was 48 hours, following which growth was stopped. Data are presented on four variables: cell mass index, nephlometric turbidity, opacity, and sporulation quality, the first two, with three decimal places, are continuous variables, while the last two are integer (0 to 10), and ordinal (1, 2, or 3), respectively. Methods followed standard guidelines. (Merck Vet Manual, 2012) For details, see Appendix A2.

TABLE 6: BLACK QUARTER – EXPERIMENTAL DATA

TABLE 6a CELL MASS INDEX

DATES	A	B	C	D	E
12.10.11	0.5	2.6	1.2	0.6	0.7
13.10.11	1.7	1.8	1.85	2.65	2.3
17.10.11	0.4	2	1	0.5	0.6
18.10.11	1.2	2	1.4	0.6	0.7
21.10.11	1.4	2.5	1.4	0.6	1.8
22.10.11	0.4	2.4	1	1	0.4
26.10.11	0.4	1.9	1.3	0.6	0.5
28.10.11	0.6	1.9	1.4	0.6	1.1
F (Cols = Times) = 13.2				p < 0.0001	
F (Rows = Days) = 4.24				p = 0.0027	

TABLE 6c OPACITY

DATES	A	B	C	D	E
12.10.11	5	10	8	6	6
13.10.11	9	10	10	10	10
17.10.11	4	10	8	5	6
18.10.11	8	10	9	6	6
21.10.11	9	10	9	6	10
22.10.11	4	10	8	5	4
26.10.11	4	10	8	5	5
28.10.11	5	10	8	5	8
F (Cols = Times) = 17.3				p< 0.0001	
F (Rows = Days) = 5.66				p= 0.0004	

TABLE 6b NTU TURBIDITY

DATES	A	B	C	D	E
12.10.11	155	420	246	179	190
13.10.11	295	300	314	434	412
17.10.11	123	380	228	146	175
18.10.11	224	370	285	180	184
21.10.11	293	422	285	176	305
22.10.11	133	400	232	224	128
26.10.11	138	327	265	163	155
28.10.11	160	332	260	165	224
F (Cols = Times) = 12.17				p < 0.0001	
F (Rows = Days) = 3.58				p = 0.0071	

TABLE 6d SPORULATION QUALITY

DATES	A	B	C	D	E
12.10.11	1	3	2	1	1
13.10.11	3	3	3	3	2
17.10.11	1	3	2	2	1
18.10.11	2	3	2	2	2
21.10.11	2	3	2	2	3
22.10.11	2	3	2	1	1
26.10.11	1	3	2	1	1
28.10.11	1	3	2	2	1

Tables 6a-6d Caption: Tables 6a-6d present four datasets on Black Quarter vaccine production at five different times on eight days. Cell Mass Index data is given in data block, 6a, spectrophotometer-based nephlometric turbidity data in nephlometric turbidity units (NTU) in the second block, 6b, spectrophotometric opacity readings in the third block, 6c, and cell sporulation quality in the fourth and final block, 6d. 2-Facotor ANOVA F values for the columns and rows for each block of data are given underneath 6a& 6b. In this data Column B (and C) and Day 2 (and 5) stand out, as can be seen from visual inspection. The data demonstrate that BQ output values are enhanced by starting at specific times and on specific days. Variations are not purely random.

Tables 6a-6d present the data sets. It is immediately apparent that specific times of the day, columns B and C, yielded higher values, and two ***days*** (13.10.11 and 22.10.11) yielded higher average values than the other six. All four data sets strongly agree on this point. Table 6d's ordinal data for sporulation quality making it visually clear. 2-factor ANOVAs were performed

on the CMI and NTU, continuous variable, datasets. These yield F (cols / rows) = 13.2 / 4.24 (CMI) and 12.17 / 3.58 (NTU).

F and p values being significant, t tests were conducted. For NTU data, column B yields 2-tailed 't' test p values of 0.0007 (A), 0.0026 (C), 0.0080 (D) and 0.0096 (E) with the other columns, Column C yields p values of 0.0028 (A), 0.082 (D) and 0.135 (E). No pairings of Columns A, D and E approach significance. With 10 possible paired 't' tests in the table, Bon Ferroni Correction reduces the threshold of p to 0.005, so only p values for AB, AC and BC reach the required threshold. The combined product of these yields an overall**p** = 5.1×10^{-9}.

Another way to assess the significance of this data is to combine the datasets in such a way that adjustments are made for the different units and ANOVA's are not prejudiced. Each data set was therefore normalized by subtracting its mean from each data point, and dividing by its standard deviation. The two normalized data sets were then combined in a single data table, Table 6e, and a 2-Factor MANOVA performed – as shown stage by stage in the table. The results were highly significant with $p < 0.0001$ for both the Rows factor, experiment dates, and the columns, times of the days, giving a combined p value $p < 10^{-8}$ for the two factors together.

TABLE 6e: Normalized BQ CMI & NTU Data, 2-Factor MANOVA

DATES	R1	VI	D1	D2	M1	Row Mean	Row SD	Total	Mean Total Sq
12.10.11	-0.76	-1.05	1.93	-0.05	-0.91				
	-0.65	-1.02	1.81	-0.05	-0.77	-0.15	1.12	-1.51	0.23
13.10.11	1.51	0.66	0.8	0.87	2.01				
	1.72	0.47	0.53	0.68	1.96	1.12	0.61	11.19	12.53
17.10.11	-0.91	-1.19	1.08	-0.34	-1.05				
	-0.81	-1.36	1.38	-0.24	-1.12	-0.45	0.96	-4.55	2.07
18.10.11	-0.76	-0.05	1.08	0.23	-0.91				
	-0.71	-0.28	1.27	0.37	-0.75	-0.05	0.78	-0.52	0.03
21.10.11	0.8	0.23	1.79	0.23	-0.91				
	0.58	0.45	1.83	0.37	-0.8	0.46	0.9	4.58	2.1
22.10.11	-1.19	-1.19	1.65	-0.34	-0.34				
	-1.31	-1.26	1.59	-0.2	-0.28	-0.29	1.1	-2.86	0.82
26.10.11	-1.05	-1.19	0.94	0.09	-0.91				
	-1.02	-1.2	0.81	0.15	-0.94	-0.43	0.84	-4.3	1.85
28.10.11	-0.2	-0.91	0.94	0.23	-0.91				
	-0.28	-0.97	0.87	0.1	-0.91	-0.2	0.73	-2.03	0.41
Means	-0.31	-0.62	1.27	0.13	-0.47	0	78	Rows SS	20.03
StDev	0.95	0.73	0.45	0.34	0.98	0	78	Rows MS	2.86
Totals	-5.04	-9.86	20.32	2.09	-7.52	Cols SS	Cols MS	20.7	9.4
Mean of (Sum)Sq	1.59	6.07	25.8	0.27	3.53	37.26	9.32	30.6	0.265

Table 6e Caption: Table 6e shows the 2-Factor MANOVA for BQ Experiment Data Tables 6a (CMI) & 6b (NTU) after normalizing each dataset by subtracting its Mean and dividing by its overall SD. Notably, the F values for both Rows (Days) and Columns (Starting Times) were large enough to yield highly significant p values for the degrees of freedom (4 for Columns, 7 for Rows, and 68 for the Remainder). It is also significant that only 26.5% of the variance remained unaccounted for, so 73.5% was attributable to the two factors. The overall statistical significances (**p**< 0.0001 for both Rows and Columns) yield an overall $\mathbf{p < 10^{-8}}$.

6.3 HEMORRHAGIC SEPTICEMIA VACCINE PRODUCTION

The second bacterial growth experiment was similar to the first, testing the same hypothesis for the process of Hemorrhagic Septicemia (HS) (*P. Multocida*) bacterial vaccine production. Methods followed standard OIE Terrestrial Manual guidelines. (Shrivastava S.K., 2010) For details, see Appendix A3.

Two datasets were obtained, CMI and NTU, displayed in Tables 6f and 6g.

TABLES 6f and 6g: HEMORRHAGIC SEPTICEMIA – EXPERIMENTAL DATA

TABLE 6f CELL MASS INDEX

DATES	A	B	C	D	E
01.02.12	1.4	1.44	1.51	1.49	1.39
02.02.12	1.34	1.41	1.48	1.41	1.37
03.02.12	1.28	1.32	1.5	1.49	1.36
04.02.12	1.33	1.41	1.49	1.46	1.30
05.02.12	1.36	1.32	1.49	1.5	1.35
06.02.12	1.31	1.41	1.48	1.47	1.30
08.02.12	1.33	1.36	1.5	1.48	1.32
F (Cols = Times) = 35.45				p <0.0001	
F (Rows = Days) = 1.67				p=0.17 NS	

TABLE 6g NTU DATA

DATES	A	B	C	D	E
01.02.12	94	98	62	145	118
02.02.12	107	92	124	126	122
03.02.12	51	62	62	63	51
04.02.12	80	78	90	98	82
05.02.12	57	60	62	61	44
06.02.12	141	182	221	174	141
08.02.12	114	154	164	187	115
F (Cols = Times) = 2.40				p = 0.0781	
F (Rows = Days) = 29.65				p< 0.0001	

2-Factor MANOVA on both data sets combined:	Cols p = 0.00001, Rows p = 0.0024

Tables 6f & 6g Caption: Tables 6f and 6g present two datasets from production runs of HS vaccine at five different times on the seven dates given in the left-most column. Cell Mass Index data in grams is given in the first data block, and spectrophotometer-based turbidity data in NTU in the second block. 2-Factor ANOVA F values for the columns and rows, together with corresponding p values, are given underneath each data block. It is not clear why the two data blocks show completely different day / time F values.

Results are very similar to those for the BQ experiment. 2-Factor ANOVAs suggest strong dependence on both factors with significant p values. Normalizing and combining the data to perform a 2-Factor MANOVA (Table 6h) gives **p**<0.0001 for times of day, and **p** = 0.0010 for days, both highly significant. This indicates that variations of rate exist specific to particular days as well as to times of day. Not only does starting time produce undeniable effects, but days again produce a large influence requiring systematic explanation.

TABLE 6h: Normalized HS CMI & NTU Data, 2-Factor MANOVA

DATES	Rāhukāla (1.15-1.30)	Meena (9.45-10.17)	Meesha (11.30 11.45)	Vri-shabha (12.00-1.15)	Mithuna (3.45-4.30)	Row Mean	Row SD	Total	Mean Total Sq	
01.02.12	-0.25	-0.16	-0.95	0.88	0.28					
	-0.06	0.48	1.42	1.15	-0.20	**0.26**	**0.73**	**2.60**	**0.67**	
02.02.12	0.04	-0.29	0.41	0.46	0.37					
	-0.87	0.07	1.02	0.07	-0.47	**0.08**	**0.53**	**0.82**	**0.07**	
03.02.12	-1.20	-0.95	-0.95	-0.93	-1.20					
	-1.68	-1.14	1.29	1.15	-0.60	**-0.62**	**1.01**	**-6.21**	**3.86**	
04.02.12	-0.56	-0.60	-0.34	-0.16	-0.51					
	-1.01	0.07	1.15	0.75	-1.41	**-0.26**	**0.77**	**-2.61**	**0.68**	
05.02.12	-1.06	-1.00	-0.95	-0.98	-1.35					
	-0.60	-1.14	1.15	1.29	-0.74	**-0.54**	**0.95**	**-5.38**	**2.89**	
06.02.12	0.79	1.69	2.55	1.52	0.79					
	-1.28	0.07	1.02	0.88	-1.41	**0.66**	**1.25**	**6.63**	**4.40**	
08.02.12	0.19	1.08	1.30	1.80	0.22					
	-1.01	-0.60	1.29	1.02	-1.14	**0.41**	**1.05**	**4.15**	**1.72**	
Means	**-0.61**	**-0.17**	**0.67**	**0.64**	**-0.53**	**0.00**	**68.0**	**Row SS**	**14.29**	
StDev	**0.68**	**0.84**	**1.07**	**0.85**	**0.73**	**0.00**	**68.0**	**Row MS**	**2.38**	
Totals	**-8.54**	**-2.41**	**9.41**	**8.91**	**-7.36**	**Cols SS**	**Cols MS**	**32.2**	**4.36**	F_{Rows}
Mean of (Sum)Sq	**5.21**	**0.42**	**6.32**	**5.67**	**3.87**	**21.49**	**5.37**	**9.83**	**0.55**	**p = 0.0010**
								F_{Cols}	**p < 0.0001**	**0.47**

Table 6h Caption: Table 6h shows the calculation of a 2-Factor MANOVA for the two HS Experiment Data Tables 6f and 6g after normalization by subtracting the Table Mean and Dividing by the respective Table SD. It is noteworthy that once again, the Fisher's F statistic for both the Rows (Days) and Columns (Starting Times) reached values of considerable statistical significance for the degrees of freedom for the Table (4 fir Columns, 6 for Rows, and 59 for the remainder degrees of freedom for the Table with 70 data points). Also significant is that only 47% of the variance is unaccounted for, 53%is attributable to the two factors. The overall significance (**p** = 0.001 for rows and **p**< 0.0001 for columns yields an overall $\mathbf{p < 10^{-7}}$.

6.4 CONCLUSION

Both sets of bacterial vaccine production experiments were observational, monitoring normal vaccine productions runs started at different times of day on several days. Both showed undeniable dependence of data values on starting time, for both times of day and different days on which observations were made. Agreement on these facts is striking: intra-time variances (columns) were far smaller than the overall variances, and this was visually apparent in fiveof the six datasets Tables 6a,b, c,d, & f. When days are included, all six datasets strongly support the overall experimental hypothesis that starting time exerts a systematic influence on microbial growth processes, with overwhelming statistical significance.

In both sets of experiments, the residual variance after both factors have been taken into account are 26.5%and 47%respectively. A conservative estimate of the systematic variance associated with starting time slots, including days as well as the hypothesized times of the day is therefore 60%. The implications of this finding for the theory of variances in microbial processes are massive. Variations which correlate with external variables cannot be purely random, and should have identifiable causes related to the variables concerned.

The overall discussion in Chapter 9 will consider the implications of this last statement in more detail.

7 VIRAL VACCINE PRODUCTION EXPERIMENTS

7.1 INTRODUCTION

Five experiments were conducted on viral vaccine production *in vitro* by virus propagation in appropriate host cells. The first used Bluetongue virus. Four experiments have now used that system, which seems to work well for testing starting time effects. The second experiment used Raniket virus propagation in 9-day old chicken embryos, and is presented first.

7.2 RANIKET VIRUS EXPERIMENT

In this experiment, 9 day old chick embryos obtained from Bobcock breeds, Bangalore were infected with Raniket Virus strain NDV – Lasota, obtained from Indian Veterinary Research Institute. At each given time of infection, 200 Bobcock embryos, divided into 5 groups of 40, were used. Methods and materials were as recommended by standard OIE procedures (see Appendix A4). Table 7a presents the data. Maxima were of particular interest: two consistent maxima within a two hour period in the production runs of Raniket virus (first series) seemed to preclude conventional biological explanation based on biorhythms. (Alexander D.J., 2010)

TABLE 7a: 78 hour Growth of Raniket Virus in Bobcock Embryos

A 10.00am		**B 11.00am**		**C 11.20am**		**D 12.05pm**		**E 01.00pm**		**F 03.00pm**		**G 04.25pm**	
Group	Titre Dilution	Group	Titre Dilution	Group	Titre Dilution	Group	Titre Dilution	Group	Titre Dilution	Group	Titre Dilution	Group	Titre Dilution
A1	**10**	B1	11	C1	**10**	D1	**10**	E1	11	F1	**10**	G1	9
A2	**10**	B2	11	C2	**10**	D2	**10**	E2	11	F2	**10**	G2	9
A3	**10**	B3	11	C3	**10**	D3	**10**	E3	11	F3	**10**	G3	9
A4	**10**	B4	11	C4	**10**	D4	**10**	E4	11	F4	**10**	G4	9
A5	**10**	B5	11	C5	**10**	D5	**10**	E5	11	F5	**10**	G5	9
A	**10**	**B**	**11**	**C**	**10**	**D**	**10**	**E**	**11**	**F**	**10**	**G**	**9**

Table 7a Caption: Batches of 200 fertilized Bobcock Chicken Eggs, A to G, were divided into five groups of forty. At the seven times given in the top line, these were infected with Raniket virus according to standard procedures. Two times, B and E, were under strong inauspicious influence, while time G was under a strong auspicious influence. Methods are contained in Appendix A4.

With all SD's zero, no 't' tests can be performed, but the null hypothesis states that any variations are purely due to chance: This opinion on such ordered data can be tested using Fisher's Permutation Test which yields **p** = (5!10!20!/35!) x (7!/4!2!1!) = 10^{-11} << 0.0001.

Microbiological opinion has opined that this data is inadequate for publication in a top journal, because (1) the nature of the assay includes subjective judgment, and the technicians performing the various assays were not totally blinded; and (2) the assay itself is not powerful, consistent and accurate enough to form the basis for a major new scientific discovery. Point (1) can be answered as follows, the technicians only knew which samples were taken at the same time, but not the hypothesis concerning the different samples: while a tendency to score so the different times agreed with each other may have been present, there could not have been any to produce agreement with predictions. Point (2), on the other hand is completely out of order: any inherent weakness in the assay can only serve to reduce the statistical significance of the final result, but that is excellent, despite any inherent weakness in the assay, which must therefore have been good enough for the stated purpose, if not as an ideal. The data therefore establishes beyond any possible doubt that batches started at different times yield different results, and that auspicious and inauspicious tendencies are followed as predicted.

7.3 THE FIRST BLUETONGUE VIRUS EXPERIMENT

7.3.1 In the Bluetongue Virus Experiment, we present results of experiments of 120 hours propagation of Bluetongue virus, in Baby Hamster Kidney BHK21 cells. Assay was standard HA virus titration. Please see the standard OIE protocol (Daniels P., 2010) in Appendix A5.

The first experiment compared runs started at the highly inauspicious time of *Rāhukāla* with another, specific time, *Thula L̤agna*. $TCID_{50}$ measures of the resulting Bluetongue virus growth titers are given in Tables 7b and 7c below.

TABLE 7b: BT Virus Infection of BHK21 (Cell Line 13) Cells for Two Starting Times

DAY⇩TIME ⇨	Cultivation Method	TIME A $TCID_{50}$	TIME B $TCID_{50}$	TIME B minus TIME A
		Thula *Ḻagna*	Rāhukāla	Rāhu - Thula
Day 1 25.08.11	Monolayer	5.76	6.31	+ 0.55
Day 1 25.08.11	Cocultivation	5.36	6.24	+ 0.88
Day 2 29.08.11	Monolayer	4.75	5.25	+ 0.50
Day 2 29.08.11	Cocultivation	4.63	4.75	+ 0.12
Day 3 02.09.11	Monolayer	5	6	+ 1.00
Day 3 02.09.11	Cocultivation	4	5	+ 1.00
Day 4 06.09.11	Monolayer	5.18	7.66	+ 2.48
Day 4 06.09.11	Cocultivation	5	7.24	+ 2.24
	Mean	4.96	6.06	1.10
	St Deviation	0.525	1.038	0.836
		Paired t and p Values		3.72 / 0.0074

Table 7b Caption: Table 7b presents $TCID_{50}$ values of Bluetongue virus concentration obtained in two related assays on four different days started during two different time slots. The null hypothesis was that no differences were to be expected over the 120 hour incubation period. Visual inspection of the data reveals that values at Time A were consistently less than those at Time B.

In Table 7b, the Time A – Time B differences are consistent for both cocultivation and monolayer. A sign test yields significance p = 0.0039. Similarly, a paired t test on the differences column yields t = 3.72, p = 0.0074 (df = 7). The data rejects the null hypothesis of no systematic differences in virus propagation between selected starting times.

However, there is more: the data in Table 7b are better analyzed by 2-Factor ANOVA, presented in Table 7c which has monolayer/cocult differences partialled out. This yields F_{Cols}= 7.47 for days, with p_{Cols} = 0.0053 (df = 3/11), and F_{Rows} = 18.63, with $\mathbf{p}_{Row}$ = 0.0012 (df = 1/11). Taking into account the systematic between days variance has greatly improved statistics for

TABLE 7c: 2-Factor MANOVA for First Bluetongue Virus Experiment

					KEY	KEY VAR's	KEY	F's CALC	
TABLE DETAILS	# ROWS	# COLS	# CELLS	REM DF	ARRAY SUM	SUMSQ	REM SS	F_{Rows}	F_{Rows}
	2	4	16		(SUM)Sq / #Cells	TSS	F_{Cols}	REM MS	Rows MS / REM MS
Degrees of Freedom	1	3	15	11	TSS = SUMSQ - (SUM)Sq/#Cells		F_{Cols} = Col MS / REM MS		REMSS / TSS
DATES → TIMES ↓	25.08.11	29.08.11	02.09.11	05.09.11	MEAN	SD	TOTAL	Mean Total Sq	
TIME A	5.53	4.52	4.77	4.95	4.96	0.47	39.68	196.8	
	5.59	4.86	4.23	5.23					
TIME B	6.08	5.02	5.77	7.43	6.06	1.00	48.45	293.4	
	6.47	4.98	5.23	7.47					
COLUMN MEAN	5.92	4.85	5.00	6.27	88.13	498.8	Rows SS	4.81	
COLUMN STDEV	0.44	0.23	0.66	1.37	485.43	13.43	Rows MS	4.81	
COLUMN TOTAL	23.67	19.38	20.00	25.08	COLS SS	Cols MS	2.84	18.63	F_{Rows}
MEAN of (SUM)Sq	140.07	93.90	100.00	157.25	5.78	1.93	7.47	0.26	
							F_{Cols}		0.2113

Table 7c Caption: Table 7c combines the cocult and monolayer readings into a 2-Factor MANOVA for the BTV data table. It compares auspicious with inauspicious timeslots, to test the hypothesis that 'inauspicious' Rāhukāla would improve virus propagation and the number of doses of Vaccine produced, since its influence is fundamentally inimical to life. In this endeavour it obtains the very high F value of 18.63. The analysis also shows that output systematically varied with days, obtaining an F value for the columns of 7.47 (df = 3/11), giving p= 0.0053. For the comparison between timeslots, the F = 18.63 gives p = 0.0012 Both factors, timeslot and day, significantly influence yield, accounting for about 79% of variance – all but the 0.2113, REMSS/TSS fraction at the bottom right.

times of day. Since the two p values are independent, the overall significance against the null hypothesis of 'no dependence on starting time' is their product: $p = 6.4 \times 10^{-6}$.

Same as for the bacterial growth experiments, starting time dependence shows systematic variations with days, as well as systematic differences between timeslots on the same day. How and why this turns out to be the case is a cause for future theoretical consideration.

. Table 7d shows that differences between monolayer and cocult are consistently, monolayer < cocult, as expected. This constitutes a preliminary check on data accuracy, and indicates

assay reliability: mean difference 0.46. Greater weight can be placed on Table 7b's Time A vs. Time B data analysis.

Table 7d: Alternative Data Analysis of Bluetongue Virus propagation in BHK-21 Cells

DAY	SELECTED TIME	Monolayer $TCID_{50}$	Cocult $TCID_{50}$	Monolayer Minus Cocult
Day 1 25.08.11	**Time A**	**5.76**	**5.36**	**0.40**
Day 1 25.08.11	**Time B**	**6.31**	**6.24**	**0.07**
Day 2 29.08.11	**Time A**	**4.75**	**4.63**	**0.12**
Day 2 29.08.11	**Time B**	**5.25**	**4.75**	**0.50**
Day 3 02.09.11	**Time A**	**5**	**4**	**1.00**
Day 3 02.09.11	**Time B**	**6**	**5**	**1.00**
Day 4 06.09.11	**Time A**	**5.18**	**5**	**0.18**
Day 4 06.09.11	**Time B**	**7.66**	**7.24**	**0.42**
	Mean	**5.74**	**5.28**	**0.46**
	Variance	**0.88**	**1.04**	**0.13**
	St Dev	**0.938**	**1.019**	**0.37**

Table 7d Caption: Table 7d presents $TCID_{50}$ values of Bluetongue virus concentration obtained on four different days from two related two modes of cell culture, cocult and monolayer, started during two different times. Differences are predicted between the modes of cell culture, as presented here, but not between the starting times, presented in Table 7b. The consistency of observed differences between cultivation methods has definite implications for experimental errors:they must produce standard deviations considerably smaller than the mean difference observed between the two cultivation methods, 0.46. This in turn implies that the analysis in Table 7b is trustworthy.

A more powerful test of statistical significance of the data can be obtained by observing that $TCID_{50}$ values are calculated from numbers of wells infected at each dilution (Table 7e), so pairs of infected wells can be compared at each stage of dilution and sign tests applied to appropriate null hypotheses. Table 7e contains 18 pairs of values where values at the inauspicious time aregreater than those at the other time, and 2 pairs where values are equal, and not 6 or 0. A sign test (binomial test) for 18:2 yields $p = 0.0002$, while one for 20:0, corresponding to a slightly different null hypothesis, yields $p = 0.00000095$. Differences in monolayer $TCID_{50}$ values on Day 4 were 2.48, i.e. 300 times more virus production.

TABLE 7e: BTV RAW DATA – Vials Successfully Infected at each Stage of Dilution

METHODS	TIME	1	2	3	4	5	6	7	8	9	10
Monolayer	09.44-01.51	6	6	6	6	5	2	1	0	0	0
	13.39 -15.13	6	6	6	6	6	3	2	0	0	0
Cocult	09.44 -11.51	6	6	6	6	4	1	0	0	0	0
	13.39 -15.13	6	6	6	6	5	4	1	0	0	0
Monday 29th August 2011											
Monolayer	09.29-11.35	6	6	6	6	2	0	0	0	0	0
	07.22-08.56	6	6	6	6	4	0	0	0	0	0
Cocult	09.29-11.35	6	6	6	5	2	0	0	0	0	0
	07.22-08.56	6	6	6	6	2	0	0	0	0	0
Friday 2nd September 2011											
Monolayer	09.25-10.30	6	6	6	6	3	0	0	0	0	0
	10.30-12.00	6	6	6	6	4	2	0	0	0	0
Cocult	09.25-10.30	6	6	6	2	2	0	0	0	0	0
	10.30-12.00	6	6	6	4	2	0	0	0	0	0
Tuesday 6th September 2011											
Monolayer	09.00-11.0	6	6	6	6	3	1	0	0	0	0
	15.30-16.30	6	6	6	6	6	6	5	0	0	0
Cocult	09.00-11.00	6	6	6	4	2	0	0	0	0	0
	15.30-16.30	6	6	6	6	6	6	4	0	0	0

Table 7e Influence of time of infection of BHK cells on infectivity: 10-fold serial dilutions of Blue Tongue Virus Serotype BTV-23 was used to infect BHK21 Cell line 13 cells grown in a monolayer or in suspension, the first column in each row labeled 1 being raw virus suspension, the same for each experiment, and each succeeding column representing successive x10 dilutions up to a 10-9 dilution in the 10th column. Pairs which differ in value are colored blue (monolayer) and pink (cocult); the two pairs that are equal (neither 6 nor 0) are colored yellow.

7.4 CONCLUSIONS

The experiments on Raniket and Bluetongue virus propagation in their respective host cells both showed that significantly different results are obtained by choosing different starting time slots, and that times traditionally considered auspicious and inauspicious have opposite effects. They therefore support the hypotheses on which this thesis is based. Similar to the experiments described in previous chapters, they imply that time is a heterogenous variable.

8 SOLAR ECLIPSE EXPERIMENTS

8.1 INTRODUCTION

The previously described experiments show that large fractions of the variances in microbial growth processes depend on starting time slot. Observed influences corresponded well to the traditional concepts of 'auspicious' and 'inauspicious' times. The best known 'inauspicious time', is a solar eclipse, so we investigated viral propagation for both eclipses in 2012, and the first in 2013, comparing the influence of eclipse and non-eclipse starting times, and *Rāhukāla*. The BT virus protocol (Daniels P., 2010) had performed well, so it was used once again.

8.2 FIRST EXPERIMENT

Solar Eclipse of Monday 20.05.2012: Data in Table 8a.

Table 8a: Solar Eclipse Experiment 21.05.2012

	A	**B**	**C**	**D**	**E**	**F**	**G**
TIMES ⇨	02.30am-03.30 am	03.40 am 05.30 am	05.30 am 07.38 am	07.40am 08.15am	09.15 am 09.40am	09.50 am 11.57 am	12.00pm 02.00pm
BATCH ⇩	***Meena***	***Mesha***	***Vrishabha***	***Rāhukāla***	***Mithuna***	***Kataka***	***Simha***
1	**7.5**	**7.23**	**7.5**	**7.66**	**7.78**	**6.45**	**7.34**
2	**6.55**	**6.51**	**7.51**	**7.77**	**6.50**	**6.50**	**6.78**
3	**7.23**	**7.50**	**7.34**	**7.78**	**7.34**	**6.34**	**6.34**
4	**7.51**	**7.34**	**7.51**	**7.33**	**6.66**	**7.55**	**6.45**
Mean	**7.20**	**7.15**	**7.46**	**7.63**	**7.07**	**6.71**	**6.73**
StDev	**0.45**	**0.44**	**0.08**	**0.21**	**0.60**	**0.56**	**0.45**

Table 8a presents $TCID_{50}$ values for batches of BT virus started during successive time slots on 20th May, 2012, the day of 2012's first solar eclipse. Four batches were started within the each time slot, yielding the means and standard deviations given.

Seven time slots were used between 02.30 am and 02.00 pm, starting four different batches under each. The time slots consisted of the six rising signs from *Meena* (Pisces) to *Simha* (Leo),

and one under *Rāhukāla*. The hypothesis that different starting times yield observably different results is first tested by performing an ANOVA on the columns. This yields F = 2.52, p = 0.054, suggesting an effect is present, but that more data is needed to establish $p < 0.05$ significance of the overall data. The question whether 'inauspicious' eclipse times (Columns A, B, C and D) produced results different from non-eclipse times (Times E, F and G) is answered by performing a 't' test between the two blocks of data. The result, t = 3.13, yields, for df = 26, p = 0.0043, almost certainly, 'Yes'. These results stimulated a second eclipse experiment.

8.3 SECOND SOLAR ECLIPSE EXPERIMENT

Wednesday 14.11.2012: The experimental protocol for the second eclipse experiment used eight time slots, between 01.00 am and 04.00 pm, again starting four different batches under each time slot. The time slots consisted of seven rising signs from *Simha* (Leo) to *Meena* (Pisces) and one under *Rāhukāla*. Data are given in Table 8b.

TABLE 8b: Solar Eclipse Experiment 14.11.2012

TIMES ⇨	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**P**
BATCH ⇩	**1.07am 2.22am**	**2.22am 4.22am**	**4.22am 6.15am**	**6.31am 8.44am**	**8.44am 10.50am**	**10.50am 12.00pm**	**12.50pm 1.30am**	**2.10pm 3.40pm**
	Simha	***Kanya***	***Tula***	***Vrishchik***	***Dhanu***	***Makara***	***Rāhukāla***	***Meena***
1	**7.66**	**7.33**	**8.77**	**6.78**	**6.50**	**6.30**	**7.23**	**7.50**
2	**7.23**	**7.50**	**7.55**	**7.50**	**6.66**	**7.23**	**7.66**	**6.44**
3	**8.77**	**7.23**	**7.78**	**6.34**	**7.23**	**6.51**	**8.33**	**6.51**
4	**7.78**	**8.33**	**7.34**	**7.54**	**7.50**	**6.66**	**6.78**	**6.78**
Mean	**7.86**	**7.60**	**7.86**	**7.04**	**6.97**	**6.68**	**7.50**	**6.81**
StDev	**0.65**	**0.50**	**0.63**	**0.58**	**0.47**	**0.40**	**0.66**	**0.48**

Table 8b presents $TCID_{50}$ values of sets of 4 batches of BT virus vaccine started during successive time slots on 14th November, the day of 2012's second total solar eclipse. Here, time slots H, I and J were during the eclipse, while the rest, K to P, were after it had finished in South America. All four batches for each time were started within the given time slots.

The ANOVA for Table 8b yields F = 2.90, giving p = 0.02 (df = 7/24): effects are present. A 't' test between blocks of data, cols H-J, vs. cols K-P gives t = 3.81, yielding p = 0.0006 (df = 30). 'Eclipse' and 'non-eclipse' time slots most probably produce different starting time effects on the experimental system.

Tables 8a and 8b are exactly the same form. Combining data sets, and repeating 'F' and't' tests: gives, F = 2.68, p = 0.0062 (df = 14/45) against the null hypothesis being correct. The t test between eclipse (24 values) and non-eclipse (28 values) yields t = 4.49, $p < 3 \times 10^{-5}$ (df = 50): these results should be taken seriously. Finally, a 't' test between the two sets of eclipse data, columns A-D, vs. columns H-J, yields p = 0.026, a distinct difference suggesting the 2nd eclipse exerted a stronger effect. This may have been due to the first eclipse being annular, while the second was total. In contrast the 't' test between the two sets of non-eclipse times, columns E-G, and K-M+P was not significant.

8.4 THIRD SOLAR ECLIPSE EXPERIMENT

Friday 10.05.2013: A third experiment was performed on the first 2013 solar eclipse using 5 time slots between 06.30 am and 03.30 pm, again starting four different batches under each time slot. Four rising signs between *Vrishabha* (Taurus) and *Kanya* (Virgo) were used, and one *Rāhukāla* time slot. Data are presented in Table 8c below.

An ANOVA for Table 8c yields F = 1.46, which gives p = 0.026 (df = 4/15). A t test between blocks of data, cols Q-R vs. cols T-U, gives t = 1.96, which yields p = 0.07 (df = 14) consistent with previous results that'eclipse' and 'non-eclipse' time slots seem to exert different effects on BTV virus propagation. Clearly the data go in the right direction, but do not yield significance on their own. As above, data in Tables 8a, 8b and 8c have the same form and can be combined to perform a 2-Factor MANOVA to detect variance from days as well as starting times. The data is first set out in Table 8d, and the MANOVA is shown in Table 8e.

TABLE 8c: Solar Eclipse Experiment 10.05.2013

TIMES⇨	Q	R	S	T	U
BATCH ⇩	6.30 am - 7.00 am	8.30 am - 9.30 am	10.45 am - 11.45 am	12.30 pm - 1.30 pm	2.30 pm - 3.30 pm
	Vrishabha	**Mithuna**	**Rāhukāla**	**Simha**	**Kanya**
1	**6.5**	**7.55**	**6.78**	**6.5**	**6.66**
2	**7.23**	**6.66**	**7.77**	**6.78**	**5.78**
3	**6.34**	**6.45**	**6.33**	**5.33**	**6.55**
4	**6.5**	**7.55**	**6.78**	**6.5**	**6.66**
Mean	**6.64**	**7.05**	**6.92**	**6.27**	**6.41**
StDev	**0.40**	**0.58**	**0.61**	**0.65**	**0.42**

Table 8c presents $TCID_{50}$ values of sets of 4 batches of BT virus vaccine started during successive time slots on 11thMay, 2013, the day of 2013's first total solar eclipse. Here, time slots Q & R were during the eclipse, while T&U were non-eclipse; S was Rāhukāla. At each time, all four batches were started within the given time slots.

In Table 8d below, simple statistical results given at the bottom of the table, starting with means and standard deviations for each grouping of data, Eclipse – Rāhukāla – Non-eclipse and then calculating t and p values: Eclipse – Non-eclipse comparison gives $t = 4.53$, $p < 0.0001$; Rāhukāla – Non-Eclipse gives $t = 3.4$, $p = 0.0013$. All experimental hypotheses were therefore supported. These are relatively poor statistics compared to those resulting from the 2-Factor MANOVA of Table 8e, however.

In Table 8e, the unequal number of data points in each data set has been partially compensated by averaging over the two, three, or four data points for different eclipse and non-eclipse times on the same row as each Rāhukāla data point in Table 8g. Results are only approximate, not exact. Despite this, there are fascinating implications. First, the **F** value of **11.13** for the rows (different eclipse days) is about equal to the **F** value of **11.75** for the columns (different conditions, eclipse, non-eclipse and Rāhukāla). Evidently the differences between days noted for both bacterial growth experiments in 2-Factor MANOVA Tables 6e and 6h, and for the previous BT virus growth experiment in Table 7c, are also present in the eclipse data analysis of Table 8h. Both times *and* days contribute to microbiological effects of starting times,

Table 8d: Experimental Data for all Three Eclipses
Grouped according to Eclipse, Rahukala, and Non-Eclipse

EXPERIMENT	BATCHES	ECLIPSE			RĀHU KĀLA	NONECLIPSE			
SOLAR ECLIPSE 1 21.05.2012	BATCH1	7.50	7.23	7.50	7.66	7.78	6.45	7.34	
	BATCH2	6.55	6.51	7.51	7.77	6.50	6.50	6.78	
	BATCH3	7.23	7.50	7.34	7.78	7.34	6.34	6.34	
	BATCH4	7.51	7.34	7.51	7.33	6.66	7.55	6.45	
SOLARECLIPSE 2 14.11.2012	BATCH1	7.66	7.33	8.77	7.23	6.78	6.50	6.30	7.5
	BATCH2	7.23	7.50	7.55	7.66	7.50	6.66	7.23	6.44
	BATCH3	8.77	7.23	7.78	8.33	6.34	7.23	6.51	6.51
	BATCH4	7.78	8.33	7.34	6.78	7.54	7.50	6.66	6.78
SOLARECLIPSE 3 10.05.2013	BATCH1	6.50	7.55		6.78	6.50	6.66		
	BATCH2	7.23	6.66		7.77	6.78	5.78		
	BATCH3	6.34	6.45		6.33	5.33	6.55		
	BATCH4	6.5	7.55		6.78	6.5	6.66		
	Mean	7.35		Mean	7.35		Mean	6.74	
	StDev	0.59		StDev	0.58		StDev	0.52	
	N	32		N	12		N	36	
Eclipse versus Noneclipse		t value	4.5322		Rāhu & Noneclipse		t value	3.4208	
		p value	0.0001				p value	0.0013	

Table 8d Caption: Table 8d presents details of $TCID_{50}$ values of the three experiments on solar eclipse days, 21st May and 14th November, 2012, and 10th May 2013. Results for the 4 batches of BT virus vaccine started during each time slot on each eclipse day are set out according to Eclipse, Rāhukāla and Non-eclipse times.

sometimes they are almost equal. Interestingly, this result is entirely compatible with the principles of *Jyotiṣa*. Importantly, the **p** values are very small, both 0.0002. The statistical significance of the data for all three eclipses against the null hypothesis that "starting times have no effects", is $p = 4 \times 10^{-8}$, as stated in the summary table in the next Chapter.

TABLE 8e: 2-Factor MANOVA for Data for all Three Solar Eclipse Experiments 21.05.2012, 14.11.2012 & 10.05.2013

		ECLIPSE MANOVA					KEY	KEY VAR's	KEY	F's CALC
	TABLE DETAILS		# ROWS	# COLS	# CELLS	REM DF	ARRAY SUM	SUMSQ	REM SS	F ROWS
			3	3	36		(SUM)Sq / #Cells	TSS	F COLS	REM MS
	Degrees of Freedom		2	2	35	31	TSS = SUMSQ - (SUM)Sq/#Cells		F Cols = Col MS / REM MS	
DATES	ECLIPSE		RĀHUKĀLA		NON-ECLIPSE		MEAN OF ROW PAIR	STDEV OF ROW PAIR	TOTALOF ROW PAIR	MEAN OF TOTAL SQUARED
ECLIPSE 1 20.05.12	7.41	7.36	7.66	7.78	7.19	6.67				
	6.86	7.45	7.77	7.33	6.59	6.89	7.25	0.41	86.96	630.17
ECLIPSE 2 14.11.12	7.92	7.93	7.23	8.33	6.77	6.65				
	7.43	7.82	7.66	6.78	6.96	7.12	7.38	0.55	88.59	653.94
ECLIPSE 3 10.05.13	7.03	6.40	6.78	6.33	6.58	5.94				
	6.95	7.03	7.77	6.78	6.28	6.58	6.70	0.47	80.43	539.08
COLUMN PAIR MEANS		7.30		7.35		6.68	255.98	1830.80	ROWS SS	3.11
COLUMN PAIR STDS		0.47		0.58		0.35	1820.09	10.71	ROWS MS	1.55
COLUMN PAIR TOTALS		87.56		88.20		80.22	COLS SS	COLS MS	4.32	11.13
MEAN of (SUM)Sq		638.85		648.27		536.25	3.28	1.64	11.75	0.14
									F Cols = Col MS / REM MS	

Table 8e Caption: Table 8e presents a 2-Factor MANOVA calculation for the three conditions, Eclipse, Rāhukāla and Non-Eclipse against the three dates for the three eclipses measured. The excellent F values of 11.13 for rows (dates) and 11.75 for columns (conditions), both give p = 0.0002. This shows that, once again, different days can result in differences as significant as those for different times.

8.5 AVIAN REO VIRUS SOLAR ECLIPSE EXPERIMENT

Avian REO Viruses are double-stranded RNA viruses of the genus *Orthoreovirus*. They are commercially important pathogens as they can cause the poultry industry considerable losses. Though most REO virus infections have no pathological effects, some produce viral arthritis (tenosynovitis) in birds 4–16 weeks of age, affecting production and quality of meat. Outbreaks in flocks of commercial chickens can cause severe losses in meat value, so vaccination is

required. Infected birds have circulating antibodies, as demonstrated by tests, like the c-ELISA test. (Synbiotics Corporation Manual, 2013)

The fourth solar eclipse experiment was conducted during the May 2013 solar eclipse on immune response against dead Avian REO virus, the standard vaccine against REO virus for chickens. Methods are given in Appendix A6. It comprised two eclipse, and two non-eclipse starting times, and one in *Rāhukāla*, as set out in Table 8f; see also Figure 8a.

Table 8f: REO Virus Experiment Data

STARTING TIME	ECLIPSE-1 E1	ECLIPSE-2 E2	RĀHUKĀLA RK	NON-ECLIPSE-1 NE1	NON-ECLIPSE-2 NE2
Dif-Titer Cumulative	422186	395516	354086	338099	307323
MEAN per Bird	14073	13184	11803	11270	10244
SD	2609	3583	3234	2425	3769

Table 8f Caption: Table 8f presents REO ELISA data for batches of 30 COBB chickens vaccinated during time periods specified, together with Means and SDs. Larger values, E1 and E2, indicate response to vaccination was best during the eclipse. Next is that during *Rāhukāla*, and last that during non-Eclipse times, NE1 and NE2.

An ANOVA on Table 8f data, yields $F = 7.08$, and $p < 0.0001$, an excellent significance for rejection of the null hypothesis of no difference between results of experiments started at different times. This permits 't' tests between data blocks and columns, as set out in Table 8g.

Table 8g: 't' Tests between Data Blocks in Table 8f

	Eclipse	*Rāhukāla*	Non-eclipse
Mean	13628	11803	10757
StDev	3140	3234	3185
t / p	2.57 / 0.012	1.61 / 0.147	4.97 / 0.0001
Pair	**Eclipse / Rk**	**Rk / Non-Ecl.**	**Non-Ecl. / Ecl**

Table 8g Caption: Table 8g presents Table 8f block means and SDs, and t test t and p values for each column and the one to its right; the right column p and t values are between Cols 3 & 1. Two p's reach good significance.

The t test between Eclipse and Non-Eclipse blocks ($df = 118$) is very significant, $p < 0.0001$; that between Eclipse and *Rāhukāla* has good significance, $p = 0.014$ ($df = 88$); but between *Rāhukāla* and Non-Eclipse only a weak, not significant trend is present, $p = 0.147$ ($df = 88$).

Figure 8.a Mean REO ELISA Titer Readings

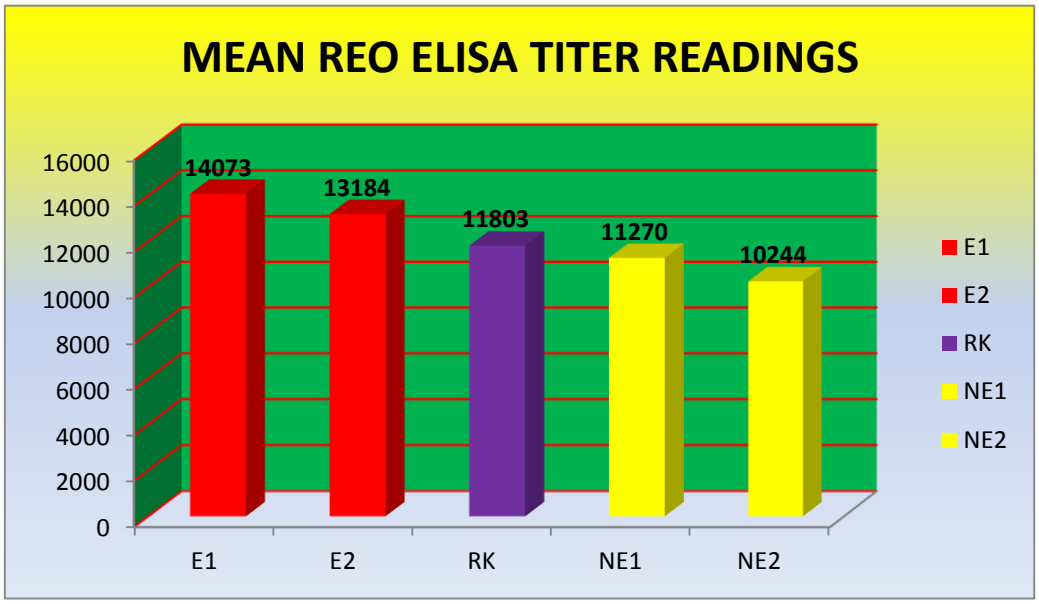

Figure 8a displays cumulative titer figures from Table 8f. It shows that Rāhukāla mean values are consistently in between Ecipse and Non-elipse values, in accordance with the E > RK > NE hypothesis derived from the BTV virus solar eclipse experiments. The chance of obtaining all five mean values correctly ordered like this is 3^{-5}, giving p = (1/243) = 0.0041.

For t tests between columns, four independent t tests can be performed between Eclipse times E1 and E2 and between Non-eclipse times, NE1 and NE2. These give E1-NE1, t = 4.3, p<0.0001; E1-NE2, t = 4.5, p < 0.0001; E2-NE1, t = 2.42, p = 0.018, and for E2-NE2, t = 3.09, p = 0.003 (all df=58). The overall product, $p << 10^{-12}$, is quoted in Table 9a, right column. For differences between *Rāhukāla* and individual columns in Table 8f, the two best p values are given in Table 8h.

Table 8h: Comparison of *Rāhukāla* and Other Times

Pair	E1-RK	RK-NE2
t	2.99	1.72
p	0.0041	0.0909

Table 8h Caption: Table 8h shows the two highest of the four t tests between *Rāhukāla* and Table 8f's other four times : *Rāhukāla* produces effects intermediate betweeen Eclipse and Non-eclipse, as in the BTV experiments.

The conclusion of the REO Virus vaccination experiment is that vaccinations performed during eclipse and non-eclipse times have distinctly different effects, and *Rāhukāla* exerts a level of influence between the two. Its results therefore support the conclusions of the BTV eclipse experiments made in the previous section of this Chapter, an important contribution to the credibility of the results of this series of four solar eclipse experiments.

8.6 SOLAR ECLIPSE EXPERIMENTS: IMPLICATIONS

A strength of the three BTV virus elipse experiments is that their results are consistent with results of the first BTV experiment in Chapter 7. Similar differences between Non-eclipse and *Rāhukāla* are seen. Furthermore, the first three experiments on BTV virus propagation combine with the fourth on REO virus vaccination to provide strong support for the hypothesis that virus propagation increases and decreases at times considered inauspicious and auspicious respectively i.e. it provides support for the concepts of 'auspicious' and 'inauspicious' times.

The experiments indicate that starting times during an eclipse can exert ongoing influences on biological processes, even at locations not touched by the eclipse: none of the three eclipses touched the Indian subcontinent, yet their effects were clearly observed. We suggest that what we are observing is some kind of non-local, *global* response of the biosphere to a total eclipse. *The experiments may be providing evidence of the biosphere responding as a whole*: a new form of the *Gaia* hypothesis. The biosphere may on occasion function as a single global entity. This idea that eclipses generate some kind of global influence on the biosphere requires further experimental investigation. The wider implications of the four experiments are that, on days of total solar eclipses, though many eclipse effects are local, at least some influences on the biosphere are global, and may be negative from a healthcare perspective.

9 DISCUSSION

9.1 SUMMARY OF RESULTS

Chapters 5 to 8 presented results of 10 experiments of 3 different kinds as summarized in Table 9.1 overleaf. All but the two on avian viral vaccines were conducted by experienced S1 microbiological scientists at IAH&VB, one of Southern India's top biological institutes, following world-standard guidelines from OIE or Merck given in Appendices A1 to A6. The first kind of experiment monitored immune response to two kinds of virus vaccine. First, PPR vaccination of small ruminants compared two rising signs. Second, the same protocol was used to compare a highly inauspicious time, *Rāhukāla*, with an average of ordinary times. Third, vaccination of Avian REO virus was used to evaluate possible differences in immune response between vaccinations during eclipse, *Rāhukāla* and non-eclipse (ordinary) starting times. The second kind of experiment monitored growth of two species of pathogenic bacteria, *P. Multocida* and *Cl. Chauvoie*, each started at five specific times on seven and eight days respectively. The third kind of experiment observed propagation of two viruses, Raniket and Bluetongue, under various forms of auspicious and inauspicious influence, including the auspicious effects of the planet Jupiter and the moon, and the inauspicious effects of *Rāhu*, *Rāhukāla* and Solar Eclipses. All classes of experiment obtained highly significant statistics, as listed in the right column of Table 9-1.

Significantly, these results can certainly be applied to improve output from production processes observed in our experiments. At a WAIRCO technology conference in Colombo in 2013, a report of these experiments (Rameshrao N. 2013a) made a great impression, and won the 'Best Paper in Conference' award, for precisely that reason. Their potential technological applications to industrial microbiological processes were clear to all. As observations of ongoing commercial processes, the experiments were zero-cost pilot experiments using well-standardized protocols, in which the supervising scientists had great experience. While their

pilot study nature may seem a weakness, the strength of their statistics is striking (Table 9.1). Though full experiments with more highly priced, time-consuming test procedures may be more convincing for specialists in each field, results so far are compelling, and make their repetition an imperative. Testing null hypotheses was their main aim. In a new field of investigation, the correct scientific question to answer is whether a phenomenon exists? Precisely quantifying it with more accurate methods of measurement constitutes the *second* stage. Refuting null hypotheses is the correct first goal.

TABLE 9.1: Ten Starting Time Experiments on Microbes of Vetterinary Importance

#	System	Vaccine	Dates	DF	p Value	Test	p value(s)
1.	Immune Response	PPR	02.12.2007 2 *Lagna*s	101	FET 2-Tail p =0.0029	t = 4.904	$p_2 = 2 \times 10^{-6}$
2.	Immune Response	PPR	09.08.2008 Rāhukāla	24	FET 2-Tail p =3 x 10^{-5}	Binomial	$p = 5.66 \times 10^{-7}$
3.	Vaccine Culture	BT Virus	4 Days 08-09.2011	4 x 4	$p_1 = 0.0039$ $p_2 = 0.0140$	Binomial Test	$p_1 = 0.0002$ $p_2 = 10^{-6}$
4.	Vaccine Culture	*C. Chauvoei*	8 Days 10.2011	5 x 8	$p_1 < 0.0001$ $p_2 < 0.0001$	$F_R = 30.6$ $F_C = 9.40$	$p_t <<< 10^{-8}$ (Overall)
5.	Vaccine Culture	Raniket Virus	18.11.2011	5 x 7	$p < 10^{-11}$	Inter Column	0.24×10^{-12} (Overall)
6.	Vaccine Culture	*P. Multocida*	7 Days 02.2012	5 x 7	$p_1 < 0.0001$ $p_2 = 0.0010$	$F_R = 9.83$ $F_C = 4.36$	$p_t < 10^{-7}$
7-9.	Vaccine Culture	BT Virus Eclipses 1-3	20.05.2012 14.11.2012 10.05.2013	4 x 7 4 x 8 4 x 5	$p_1 = 0.0538$ $p_2 = 0.0020$ $p_3 = 0.0026$ $p_{123} = 0.0003$	$F_R = 11.13$ $F_C = 11.75$	$P_R = 0.0002$ $P_C = 0.0002$ $p_T = 4 \times 10^{-8}$
10.	Immune Response	REO Virus	10.05.2013	5 x 30	$p < 0.0001$	t = 3.81	p = 0.0006

Table 9a Caption: Table 9a presents overall statistics for ten experiments investigating possible influences of starting time on processes in veterinary biology including vaccination of live and dead viruses, and growth or propagation of microbes of veterinary importance.

The experiments identified a series of related effects. First, influence of starting times on the outcome of microbiological processes: this effect is revealed either directly in the data or by statistical analysis; it depends on no hypothesis, and is clearly present to good statistical significance in all data sets, some when combined, as in experiments 7 to 9 on solar eclipse starting times. In all cases highly significant statistical refutations of the relevant null hypothesis were obtained when the most appropriate statistical test was employed. Data sets from experiments 3, 4, 6 and 7-9, conducted on several days, yielded two significant p values when 2-Factor ANOVAS sere performed. In other cases, notably experiment 5 on Raniket virus propagation, the initial statistic refuting the null hypothesis was astoundingly high, as a result of fortuitous experimental design.

A good example where highly significant results are visible to the naked eye is in Table 6d, for sporulation quality of BQ Vaccine. This is presented in Table 9b.

Table 9b: BQ Experiment Sporulation Quality Data
Visually Obvious Effect given by Colour Highlight

TABLE 6d SPORULATION QUALITY					
DATES	**A**	**B**	**C**	**D**	**E**
12.10.11	**1**	**3**	**2**	**1**	**1**
13.10.11	**3**	**3**	**3**	**3**	**2**
17.10.11	**1**	**3**	**2**	**2**	**1**
18.10.11	**2**	**3**	**2**	**2**	**2**
21.10.11	**2**	**3**	**2**	**2**	**3**
22.10.11	**2**	**3**	**2**	**1**	**1**
26.10.11	**1**	**3**	**2**	**1**	**1**
28.10.11	**1**	**3**	**2**	**2**	**1**

Table 9b Caption: Table 9b presents data from the BQ experiment of Chapter 6 The row and column for which means are over 2.5 are in **blue 16pt**, while those with means between 2.0 and 2.5 have remaining figures in **green 14 pt**.

The data in Table 9b offers a visually obvious pattern indicating strong dependence of means on both date (rows) and selected times during each day (columns). A 2-Factor ANOVA performed on Table 9b, though inappropriate, yields **F** values of similar magnitudes to the three variables in Tables 6a, 6b, and 6c: $\mathbf{F_{Rows}} > \mathbf{12.0}$, and $\mathbf{F_{Cols}} > \mathbf{4.0}$. Similar patterns can also be generated in the other 3 tables. In this sense, the BQ experiment needs no more statistics for its interpretation than the Raniket virus experiment. Obvious starting time effects are seen without them. There can really be no doubt that starting times are somehow affecting the growth of Cl. Chauvoie in vitro as described in Section 6.2 and Appendix A2.

An important corollary of starting time dependence of final readings is that it refutes the stochasticity hypothesis. (Federoff N. Fontana W., 2002) (Elowitz M.B., 2002) Variances in data cannot be due to purely stochastic processes when ANOVAs produce statistically significant results. Purely random variations in microbiological processes can never correlate with external factors. High ANOVA 'F' values produce their own challenges: to *propose* physical mechanisms by which identified external factors may influence internal processes in the organisms concerned.

Here the fraction of variance remaining after 2-Factor ANOVAS have been performed i.e. the decimalrs in the lower right corner boxes of Figures 6e, and 6h, 7c and 8e, are of great significance: they limit the fraction of variance to which stochasticity may apply to 0.265 (6e), 0.467 (6h), 0.2113 (7c), and 0.14 (8e), averaging 0.27, about a quarter of the total. An average of 73%, maximum 86%, of variance *originates in starting time effects*. This is further discussed in Section 9.3 below.

The second discovery consistently observed in all experiments is that starting times traditionally considered 'auspicious' and 'inauspicious' exert opposite effects on outcomes of microbiological processes. Starting at supposedly 'inauspicious times' opposed the life of

organisms concerned: immune response was lower, bacteria grew slower, and viruses propagated more effectively. Supposedly 'auspicious times' had the opposite effect: immune response was higher, bacteria grew better, and viruses multiplied less quickly. Specific 'inauspicious' starting times tested included solar eclipses, times like *Rāhukāla* connected with *Rāhu*, and others under that influence. In all experiments testing eclipses or Rāhu's influence, similar effects were consistently observed.

The third discovery was that predictions of *Jyotiṣa* selections of starting times were supported:

(1) *Jyotiṣa Muhūrta* (Shriram D.A, 1996): starting time exerts an ongoing influence on a biological process.

(2) Differences between outcomes of processes started at different times are predictable by *Jyotiṣa*.

(3) Specific *Jyotiṣa* predictions were tested; none were refuted.

   a. For starting times when the *graha*, *Guru*, exerted a strong influence cells survived or grew better.
   b. The North Node of the moon, *Rāhu*, was observed to oppose cellular life, and support non-cellular life (viruses).
   c. The planet Saturn, *Ṣāni*, decreased immune response, making vaccination uptake less successful.
   d. When the Moon, *Chandra*, was in different *rāśis*, she exerted different effects. For example strong *Chandra* supported organisms, protecting them from *Rāhu*, as shown, for example, in Table 9b, row dated 13.10.11, when *Chandra* was with *Guru* in *Meesha* (Aries). Similar consideratios held for 18 and 21.10.11.

The effects of Jupiter, Saturn and *Rāhu* were predicted *ab initio*. Those of *Chandra* were *post-hoc*, identified by the stronger days in the data, from the two bacterial growth experiments, and quantified in the 2-Factpr ANOVAs. Planetary influences consistent with statements in *Jyotiṣa* astrology have been identified, but more work is needed to establish that none are due to other, interfering influences: alternative explanations must be investigated.

The sequence of the 3 discoveries is important. The first ones have more certainty: influence of starting time on process outcome seems undeniable; times considered 'auspicious' and 'inauspicious' do exert the influence predicted; specific influences from *Jyotiṣa* also seem to consistently exert the effects traditionally proposed.

Consistency of observations and results merits comment: experiments on pathogenic bacteria observed the same kinds of effect in two different systems; those on virus systems found decreased virus production under one kind of influence ('auspicious for life') and increased virus production under another kind of influence ('inauspicious for life'); the four BT virus experiments produced consistent results. Despite being pilot experiments with scope for improvement in design, there can be little doubt about the value of the data obtained.

Now consider the results overall: in every case ANOVA's and t tests showed that the data contained interpretable information. If a known experimental phenomenon produces a high F value, then a definite observation of that phenomenon has been achieved. If, as in this case, a previously unknown and unsuspected effect is being hypothesized, significant values of Fisher's 'F' information statistic imply not only that a new phenomenon is being observed, but, that it also requires interpretation within the general field of scientific phenomena. Either known theories should be extended, or a theory of a distinct novel kind must be formulated. How this may be attempted is suggested in Section 9.3 below.

9.2 COMPARISON WITH EARLIER INVESTIGATIONS

As pointed out in Section 3.8, the experiments reported by Shrilakshmi (2011a-c, 2013, 2014a-c) approach those of Chapters 5 to 8 most closely. Those experiments suggest that degeneration of the organism leading to chronic conditions like autoimmune arthritis and renal failure correlate with *Janmakundali* data. Their consistent validity implies that *Grahas* may influence biological processes, and therefore the existence of hitherto unidentified possibilities in biology

that make this happen. The latter are discussed in Section 9.3. Here we focus on the relationship between the new experiments and Shrilakshmi's.

The experiments described herein confirm the suggestion iunderlined above: *Grahas* do influence biological processes. They provide requisite underpinnings for a *biology* of the experiments reviewed in Section 3.5. Lack of previous parallel *biological* experiments means that *the two series of experiments open up territory completely new to biology and medicine*.

All the experiments supported general predictions made by India's system of *Jyotiṣa* astrology. Apparently, they do not distinguish one organism from another, and can be applied to all life forms. Furthermore, *Jyotiṣa* influences must operate at least down to the single cell level. Our experiments tested *Jyotiṣa* predictions in: viral propagation in chick embryos (Rameshrao N, 2013a); growth of the anaerobic bacterium, *Cl. Chauvoei* (Rameshrao N, 2013b), and the aerobic bacterium, *P. Multocida*; and virus propagation in baby hamster kidney (BHK21) cells. (Rao R.N, 2013) In all cases, growth of cells or their resistance to pathology was tested at times considered variously auspicious and inauspicious for life, i.e. for the organism concerned. Consistent statistically significant results were obtained throughout, combining to yield very highly significant p values (Rameshrao N, 2013b), as displayed in Table 9.1: cumulative p values from all experiments are exceedingly high.

The results suggest that forces treated by *Jyotiṣa* work on all biological organisms at all times. (Hankey A., 2013) Results reject the position of scientific skepticism that *no such influences exist* with a good degree of confidence. Previous experiments, conducted purely on planetary transits at birth, have strongly suggested that the position of scientific skepticism is not valid. (Gauquelin M., 1988) (Ertel S., 1995, 1996, 1999) So do our experiments.

Concerning solar eclipses, recent research on Geographic distributions of 4000 since 5,400 BC suggests that they may negatively impact human populations. (See Figure 9a)

Figure 9a: Geographic Distributions of the Midpoints of 4,000 Solar Eclipses

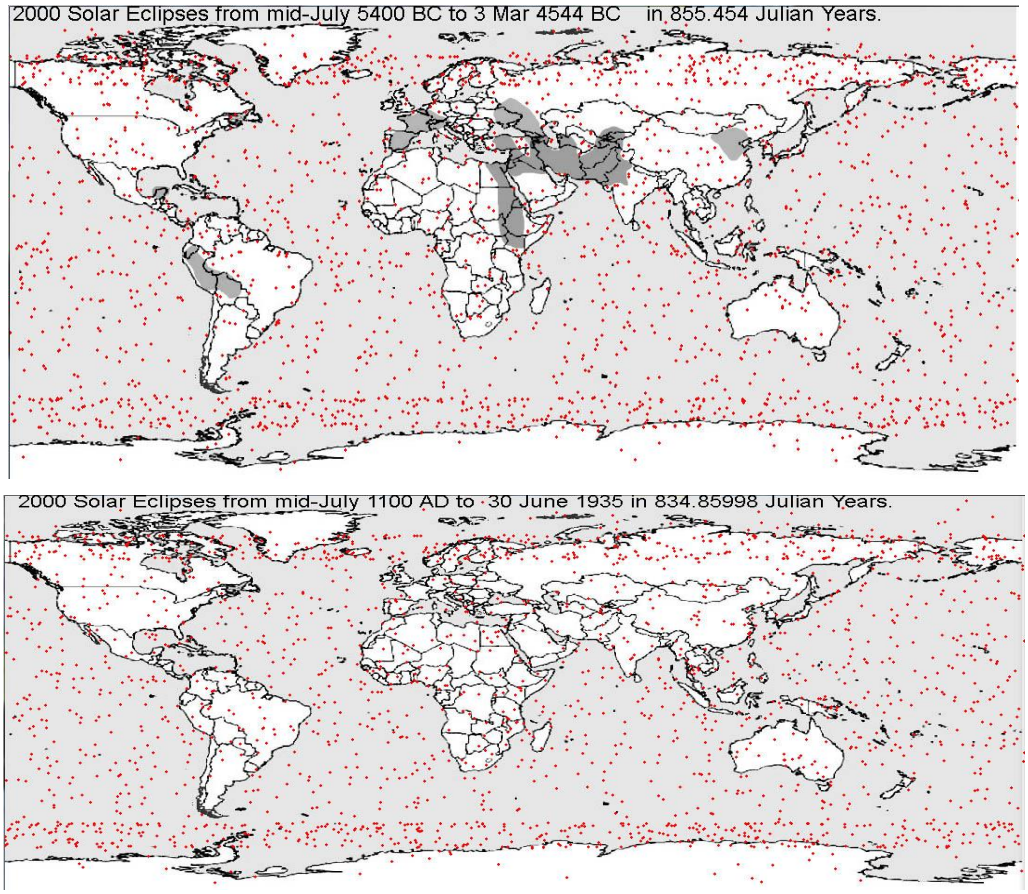

Figure 9a Caption: Figure 9a depicts the central points of two sets of 2,000 Solar Eclipses The first set, from 5,400 to 4,544 BC avoid known centers off human civilization in that era The second set from 1100 to 1935 AD seem to behave similarly.

9.3 POSSIBLE MECHANISMS BEHIND THESE RESULTS

Results have been presented from two series of experiments, those by Srilakshmi discussed in 3.5 and 9.2, and the ones presented in Chapters 5 to 8 of this thesis. These point to the existence of new fundamental aspects of biology that should begin to help explain them. In section 9.1 in was calculated that such a mechanism must apply to an average of 73% of observed variance, suggesting that it is potentially three times larger than stochasticity. Where should the new source of variance be sought? It can neither be biorhythm, nor stochastic. The only possibility available today is complexity, which concerns the fractal variations in response to external stimuli almost universally observed in physiological systems, even in cell physiology. Fractal

physiology is effectively universal (Bassingthwaite, 2004), and exemplified in the well-known phenomenon of heart rate variability (HRV).

Fractal physiology is underpinned by the well-accepted phenomenon of self-organized criticality (SOC) (Bak P., 1996) that lies at the heart of regulation of complex biological systems. Apparently, a very large fraction of regulated physiological systems are under the influence of SOC, meaning that their state of optimal regulation lies at a feedback instability, and is governed by the physics of instability, rather than the normal physics of stable systems. In contrast to the later, unstable systems possess high levels of internal correlations of a similar kind ot that shown to support the 'quantum teleportation' phenomenon, information exchange between distantly located systems (Bouwemeister D., 1997).

What this means in simple terms is that nature's preferred mode of regulation of complex biosystems, such as those found in all cells of higher organisms, permits their regulatory states to couple to distant sources of quantum correlations without regard to distance. Regulatory systems in complexity biology *could* exhibit variances dependent on external variiables, just as data from this series of experiments implies. Reasons why such external sources may include *Jyotiṣa grahas* have been briefly outlined. (Hankey, 2013) This theory applies to all phenomena under 'criticality' in complexity biology, especially phenomena connected to large variances observed in fractal physiology. Fractions of all such variances may depend on starting time variables, as observed in experiments 3, 4, and 6 to 9 in Table 9.1. For this reason, the new phenomena need not be considered outside the present body of scientific knowledge.

The experiments reported in Chapters 5-8 of this thesis, together with the possibilities inherent in complexity biology, may, if a full theory can indeed be developed, provide *biological* underpinnings for the astromical studies of Section 3.5. The implications are that a robust biophysical and astrophysical model of non-local actions of *grahas* on cell regulation may be

possible. Though almost all scientists think otherwise, a breakthrough in this field may be close. Lack of previous experiments in these fields means that those descrikbed in Section 3.5 and in Chapters 5-8 are introducing science to ground that is completely new – entirely without precedent. Many further studies of other possible biological organisms *and* etiological risk factors are needed. The ground has been broken, the field stands ready for full investigation.

To summarize: no strong models with robust supporting experiments like those presented here have prviously been available. Now, however, one may entertain the possibility that every cell on earth has always been guided by subtle influences originating outside earth herself If the proposrd mechanisms are valid, such subtle influences affect all systems regulated according to principles of complexity, including the human brain, all the time: they constantly influence the lives of everyone everywhere.

From time immemorial, *Jyotiṣa* has been guiding society, rooted in the hearts of those interested in it, who accept it without hard scientific evidence. Today it is time to remedy this defect. Precious treasures lie in nature's time-space coordinates, where all phenomena may be observed, and which can be boons for mankind, provided they are explored. The growing epidemic of Non-Communicable Diseases makes it urgent to identify new systems of variables. Science only works through sense organ-based understanding. Beyond it, a huge treasury of ancient knowledge awaits application.

10 APPRAISAL

10.1 SUMMARY

The aim of these experiments on immune response and vaccine production was to test the null hypothesis that *time is homogenous*: other than those due to known biorhythms, *systematic variations in production output depending on starting time do not exist*. The observed statistics, with values ranging from $p < 10^{-4}$ to 10^{-12}, overwhelmingly reject this hypothesis; they point to scientifically interesting information being present: starting time may have *heterogeneous* effects. Could such 'Time variables' add a new dimension to biological experiments in general?

The Aims and Objectives of the thesis were promisingly supported. In every experiment, or series of experiments, null hypotheses were soundly rejected by the overall results of the experiment(s). The idea that a well-defined starting time can influence the outcome of *purely biological* processes, was supported in every case, though in the vaccination and solar eclipse experiments combined results were needed to achieve good statistical significance. Similarly, the hypothesis that starting times traditionally considered auspicious would produce results beneficial to life was supported, as was the hypothesis that those traditionally considered inauspicious would yield results deleterious to life. Finally, the idea that *Jyotiṣa* astrology could make testable predictions was upheld, suggesting that this field requires further investigation for purely biological effects. Use of modern scientific technologies to explore the treasure of ancient knowledge and energy systems should be pursued.

If magnitude estimates are correct, however, choice of starting time may affect the economics of vaccine production: it seems likely that, if properly and fully understood, systematic increases in production efficiency at no cost or low cost may be possible. Knowledge of these effects can therefore be used to enhance industrial production processes at zero cost.If such an

approach to improving vaccine production is to be perfected, more refined quantitative evaluation must be undertaken.They require further, more rigorous, exploration.

10.2 STRENGTHS AND WEAKNESSES OF THE STUDY

10.2.1 Strengths of the Study

The experiments were carried out

a. by top-level professionals,
b. in a highly reputed State Veterinary Biological Institute,
c. under the guidance of S1 scientists, authorities in the field,
d. during ongoing professional programs, with experimenters blind to the details.
e. supported by the age and authority of traditional knowledge

They

f. were unbiased;
g. designed so data from different experiments could be combined;
h. resulted in high levels of statistical significance;
i. identified new research variables;
j. have established a new field of microbiological research.

10.2.2 Weaknesses of the Study:

a. The experiments were based on undocumented ancient science: Decoding their metaphysical concepts is challenging
b. The studies were pilot studies carried out for the first time; no reference materials were available to help design them.
c. No research funds are yet available for this kind of research, so low budgets were mandatory.
d. In the vaccination experiments, the animals were unprotected in open fields, and exposed to natural calamities.

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LIST OF APPENDICES

APPENDIX A1: EXPERIMENT 1

(RE: SECTION 5.1): VACCINATION OF SMALL RUMINANTS

Setting and Design: 53 sheep and 40 goats on Challekere farm, and 36 sheep on Dhangur Farm in Karnataka, none of which had been previously vaccinated. The groups were arbitrarily divided by a person not known to them i.e. effectively randomly selected for vaccination at two different times. Others were assigned to unvaccinated control groups. On Day 0 each animal had a blood sample taken, and was then identity taggedand vaccinated. Second blood samples were collected on Day 21. Levels of PPR (Pestes des petits ruminant) antibodies were assessed using c-ELISA (Competitive Enzyme Linked ImmunoSorbent Assay). Criteria for vaccination success were stated on c-ELISA kits (PPR Kit Manual 2005).

METHODS: All three studies were randomized control studies over 21 days. Subjects: Three groups of animals maintained under standard management conditions were used, one group of goats and two groups of sheep at two farms: Chellekere Farm in Chitradurga District, and Dhangur Farm in Mandya District, both in Karnataka, India.

1. The first group of 46 goats (at Chellekere Farm) was divided into three subgroups, 20 animals vaccinated while *Dhanu* (Sagittarius) was rising, 20 vaccinated while *Makara* (Capricorn) was rising and a standard veterinary control group of 6 unvaccinated animals. The second group of 53 sheep (at Chellekere Farm) was similarly divided into three subgroups, 21 animals vaccinated while *Dhanu* (Sagittarius) was rising, 20 vaccinated while *Makara* (Capricorn) was rising, and 12 in two control groups of 6 animals each.The third group contained 34 sheep (at Dhangur Farm) was also divided into three subgroups, 10 animals vaccinated while *Dhanu* (Sagittarius) was rising, 12 vaccinated while *Makara* (Capricorn) was rising, and 12 in two control groups of 6 animals each.

Subject Selection: Inclusion criteria: females, aged 6 to 8 months, in good health.

Exclusion Criteria: male, aged less than 6 months or more than 8 months, no history of disease, no previous vaccination.

Randomization: The groups of animals were arbitrarily divided by a person not previously known to them, and identity tagged during blood collection.

Sample Collection and Preparation: On Day 0 and Day 21, pre- and post-vaccination 10ml blood samples were collected from jugular veins of labeled animals using plain vacationer tubes and needles. Identities of each animal were labeled on the corresponding Vacationer tubes. The tubes were set tilted overnight at room temperature to promote clotting. Next morning, expeciated sera was removed from the clot after centrifugation at 1200 g at room temperature for 15 minutes, and siphoned into a sterile test tube to which the animals' identity was transferred. The separated serum was transferred to screw-capped plastic vials, and stored for future use at -20^{o}C.

Sample Analysis:Serum samples were assayed for antibody response using a standard PPR serology technique: competitive Avidin-biotin serum enzyme-linked immunosorbent assay technique (c-ELISA). c-ELISA was performed at PD ADMAS, an Indian Council for Agricultural Research (ICAR) institute, with kits procured from the Indian Veterinary Research Institute, Mukteshwar. The protocol provided by the developer was strictly followed.

Optical density (OD) values were recorded and used in the main statistical analysis. For veterinary immunology, c-ELISA considers OD equal to or less than 0.35 (the kit used to test the Chellekere farm data) and 0.40 (the kit used to test theDhangur farm data)a positive response at a wavelength of 490 nm. Percentage of positive responses was calculated, and used as a secondary, more qualitative, measure of immune response.

Statistical Analysis: Statistical analysis was performed using SPSS-10. Kolmogorov-Smirnov test was used to test normal distribution of data. Tests of Pre-post significance were carried out using the Wilcoxon Signed Ranks test; for between groups significance the Mann-Whitney U Test

APPENDIX A2

RE: SECTION 6.2 BLACK QUARTER VACCINE PRODUCTION

Materials: Freeze dried culture of *Cl. chauvoei* S-49 procured from ICAR's Indian Veterinary Research Institute, and stored at 4^0 C at IAH&VB.

Methods followed standard (Merck Veterinary Manual, 2012)

Media:

Cooked Meat preparation: 500 gms (approx.) fresh bullock heart pieces, minced in 500 ml distilled water and 1.5 ml of 1 N NaOH, simmered for 20 mins, lactic acid neutralized, and liquor pH brought to 7.5. Liquid was drained through muslin, and hot meat pressed in a cloth and partially dried.

Peptone infusion broth:

Cooked meat liquid filtrate	500 ml
Peptone	5.0 g
Sodium chloride	2.5 g
Dipotassium hydrogen-ortho phosphate	2.0 g
Sodium thioglycollate	0.5 g

broth is brought to pH 9.0 (final pH 8.2-8.4), and autoclave sterilized at 121°C for 20 min. Test tubes or 100 ml flasks are filled with meat particles from (A) to a depth of 2.5 cms, together with peptone infusion broth (test tubes 10 ml, flasks 50/90ml), covered in 1 cm liquid paraffin, and autoclave sterilized for 20 min at 121^o C.

B.Q. Vaccine ProductionMedium for subculture preparation: consists of liver/muscle/ chemical bouillon		
R.O. water1000 ml	Sodiumthioglycollate1g	Sodium chloride 5 g
Muscle tissue 250g	Liver tissue 250g	Peptone 10g
Dipotassium hydrogenPhosphate10g		

The medium is heated just below boiling point, and pH adjusted to 8.0±0.2 to give a final pH of 7.8±0.2. After filtering through eg filter paper, filtrate placed in 5 liter flasks and sterilized at 15lbs pressure at 121^0C for 30 mins.

B.Q.V media:

R.O water1000 ml , Thioglycollate broth (Hi-Media) 30 g dehydrated

Media is placed in 5L flasks, and autoclaved at 15 lbs pressure at 121°C for 20 min.

Dextrose 50% solution: is autoclaved at 10lbs pressure at 105-110^{o}C for 15 mins. Production flasks are inoculated after incubation at 37^{o}C for 48 hours.

20% formalin solution: composed the following ingredients per 100 ml:

- 20 ml formaldehyde, 80 ml of redistilled water.

After 48 hrs incubation, 0.5% final concentration is obtained by adding 20% formalin.

- Flasks are incubated at 37^{o}C for another 48 hr period.

Vaccine Inoculation Procedure:

Stage 1: Master seed culture in freeze dried form was inoculated into 100 ml Robertson's bullock heart medium (RB) plus 2.5 ml 50 % dextrose solution, incubated for 48 hrs at 37^{o}C, and then tested for gas production and color change to yellowish and examined microscopically for spore formation and purity (using Gram's staining method).

Stage 2: 100 ml RB media culture with complete spore formation together with 50 ml of 50% glucose solution was inoculated into each 2L subculture flask. Flasks were incubated at 37^{o} C for 48 hrs, and then checked for indications of good growth i.e. color change to yellowish and gas production, and microscopically for spore formation and purity.

Stage 3: 4L production flasks containing 4 litres growth media were inoculated with 200 ml subculture from flasks with complete spore formation and good growth, and 100 ml of 50% glucose solution, and incubated at 37^{o}C for 48 hrs.

Stage 4: The culture was then microscopically examined by Gram's staining method, and formalinisation carried out by adding 100 ml of 20% formaldehyde solution to each production flask, which was mixed and incubated at 37^{0} C for another 48 hrs. After microscopic examination for purity, the following measurements were made:

1) Spectrophotometer-based Nephlometric Measurement of Bacterial growth

2) Dry weight determination

3) Brown's opacity tube reading

Tests

1. Microscopic Examination to reveal Gram+ bacilli and extent of Sporulation

a) Smear fixed glass slide placed upwards. Cover slide with 0.5% crystal violet.

b) Allow to remain 1min; wash and place back.

c) Cover slide with mordant (Gram's iodine); leave 1min, wash and place back.

d) Decolorize by washing with acetone, then water, and place back.

e) Counter stain by covering smear with saffranin for 30 sec, wash thoroughly with water, blot, and dry in air.

Sporulation Assessment: One loop full (0.01 ml) of bacterial culture is taken and, after staining, the smear is observed by microscope under oil immersion.

Criteria for sporulation level: in each microscope field, the number of organisms with spores (rod-shaped, but bulging slightly in their terminal or middle regions) and without spores (slender rod-shaped) are counted. Samples with all or almost all organisms of the first kind are recorded as 'complete sporulation', all or almost all of the second kind, as 'vegetative form', and all others as 'incomplete sporulation'.

2) **Spectrophotometer-based Nephlometric Measurement of Bacterial growth and Opacity** Clean, sterilized Turbidometric cuvettes were filled with 48 hour culture, strained up to the mark indicated, inserted in the spectrophotometer slot, and readings variously taken.

3) **Dry weight determination**: the remainder of 4L flask was freeze-dried and weighed

APPENDIX A3: EXPERIMENT 3

RE: SECTION 6.3 HS BACTERIAL VACCINE PRODUCTION

Haemorragic septicaemia vaccine, a yellowish liquid containing inactivated bacteria in suspension, is a culture of *Pasteurella multocida* grown in a suitable aerobic medium and rendered sterile by addition of formaldehyde solution so that immunizing properties are retained. (Shrivastava S.K., 2010)

i. Preparation of the Media:

Suspend 25 grams in 1 L D.water; heat if necessary to dissolve medium completely; adjust pH so as to give final pH 7.3 $\pm$ 0.2. Filter through the filter cloth and distribute filtrate into 5 liter flasks. The medium is sterilized in an autoclave at 15lbs pressure at 121^0C for 20 mins.

2) Preparation and use of 20% formalin solution

Adjust quantities to yield the amount of 20% formalin solution required

Every 100 ml of the 20% formalin solution should contain:

a. 20 ml formaldehyde and 80 ml R.O/Distilled water.

20% formalin solution is added to obtain a final concentration of 0.5% formalin: dilution of 40:1..

3)Vaccine Inoculation Procedure:

The master seed culture is streaked onto Blood agar & Nutrient agar plates and incubated for 24 hours at 37^0 C, after which the culture is tested, and examined microscopically for purity. The smear is stained by Gram's staining method. An individual colony is picked up, inoculated into 100 ml nutrient broth, and then incubated at 37^0 C. After 24 hrs the culture is checked for the growth (yellowish colour of the media is an indication of good growth),and again checked microscopically for purity. A subculture with good growth is used for final inoculation of production flasks. 200 ml subculture is inoculated into 4 lts of media in production flask and

incubated at 37^0 C for 48 hrs. All inoculation and culturing work is done under strict sterile and aseptic precautions using a laminar flow chamber.

After 48 hrs the culture is microscopically examined and inactivatedusing 20% formaldehyde solution: 110 ml of 20% formaldehyde solution is added to each production flask, properly mixed and incubated at 37^0C for 48 hrs. The result is again examined for purity, and the following tests conducted:

i. Microscopic Examination by Gram's staining method (performed before formalinisation)
ii. Turbidimeter Measurement
iii. Dry Weight Determination

These are measured as follows:

1. **Microscopic Examination by Gram's staining method.**

ii. Smear fixed glass slide placed upwards. Cover the slide with 0.5% crystal violet.
iii. Allow it to remain for 1min and wash it and place it back.
iv. Cover the slide with Gram's iodine which acts as a mordant and allow it to remain for one min, wash it and place it back.
v. Decolorize with acetone by washing it with acetone and wash with water and place it back.
vi. Counter stain by covering the smear with saffranin for 30 sec, wash thoroughly with water, blot and dry in air.
vii. Microscopic study reveals the colonies are Gram negative coccobacilli.

2. **Measurement of Bacterial growth by Turbidimeter**

i. Fill a clean sterilized Turbidometric cuvette with HS vaccineculture to be measured up to the mark indicated in the cuvette.

ii. Insert the cuvette in slot provided in the turbidimeter.

iii. Take Turbidity reading in NTU (Nephrometric Turbidity Units).

3. Dry weight determination

i. Collect 1000 ml of inactivated culture.

ii. Weigh sterilized 1 L centrifuge bottles with lidsempty (W_1).

iii. Add one litre inactivated culture suspension to 1 L centrifuge bottles.

iv. Mix thoroughly and centrifuge at 4^0C at 10,000 rpm for 20 min.

v. Discard supernatant, dry remainder and weigh contents (W_2).

vi. Cell mass (wet weight) is given by W_2- W_1.

vii. Dry this pellet by placing the bottle in the incubator for one day. Its weight is the dry weight.

6) RESULTS Table A3-1

HAEMORRHAGIC SEPTICAEMIA PROJECT – Dry weight results						
Sl No	**Date**	**Rāhukāla**	**Meena**	**Mesha**	**Vrishabha**	**Mithuna**
	Time	**1.15 1.30**	**9.45 10.17**	**11.30 11.45**	**1.00 1.15**	**3.45 4.00**
1	**1.02.12**	**1.40**	**1.44**	**1.51**	**1.49**	**1.39**
2	**2.02.12**	**1.34**	**1.41**	**1.48**	**1.41**	**1.37**
3	**03.02.12**	**1.28**	**1.32**	**1.50**	**1.49**	**1.36**
4	**04.02.12**	**1.33**	**1.41**	**1.49**	**1.46**	**1.30**
5	**06.02.12**	**1.36**	**1.32**	**1.49**	**1.50**	**1.35**
6	**07.02.12**	**1.31**	**1.41**	**1.48**	**1.47**	**1.30**
7	**08.02.12**	**1.33**	**1.36**	**1.50**	**1.48**	**1.32**

Table A3-1 Caption: Table A5-1 presents dry weight measurements for production flasks started at times given on the stated dates. Columns 3 and 4 are consistently highes values. Rāhukāla and Mithuna are the lowest.

1. Measurement of Bacterial growth by Turbidimeter: Turbidimeter measures turbidity of the vaccine and expressed in Nephlometric Turbidity units (NTU). It indicates the cell mass i.e. biomass in the vaccine. The larger the NTU value, the better is the quality of the vaccine.

TABLE A3-2: HS VACCINE NTU MEASUREMENTS

HAEMORRHAGIC SEPTICAEMIA PROJECT – Time and Turbidity Read (inNTU)						
Sl No	**Date**	**Rāhukāla**	**Meena**	**Mesha**	**Vrishabha**	**Mithuna**
	Time	**1.15 1.30**	**9.45 10.17**	**11.30 11.45**	**1.00 1.15**	**3.45 4.00**
	Media	**10**	**10**	**10**	**10**	**10**
1	**1.02.12**	**240**	**240**	**240**	**240**	**240**
	48 hrs	**334**	**338**	**302**	**385**	**358**
2	**2.02.12**	**228**	**228**	**228**	**228**	**228**
	48 hrs	**335**	**320**	**352**	**354**	**350**
3	**03.02.12**	**289**	**289**	**289**	**289**	**289**
	48 hrs	**340**	**351**	**351**	**352**	**340**
4	**04.02.12**	**372**	**372**	**372**	**372**	**372**
	48 hrs	**352**	**350**	**362**	**370**	**354**
5	**06.02.12**	**258**	**258**	**258**	**258**	**258**
	48 hrs	**315**	**318**	**320**	**319**	**302**
6	**07.02.12**	**223**	**223**	**223**	**223**	**223**
	48 hrs	**364**	**405**	**444**	**397**	**364**
7	**08.02.12**	**235**	**235**	**235**	**235**	**235**
	48 hrs	**349**	**389**	**399**	**422**	**350**

Table A3-2 Caption: Table A5-2 presents **r**aw NTU measurements i.e.beginning and ending NTU readings for cultures started at the times shown on the dates indicated. Results indicate that inoculation at particular times on these days, 11.30 am and 1.00 pm, yielded larger values forboth parameters i.e.greater yield for production flasks started at these times.

APPENDIX A4: EXPERIMENT 4

RE: SECTION 7.2 RANIKET VIRUS VACCINE PRODUCTION

Inoculation used a 10^{-5} dilution of seed virus with EID_{50}litre $10^{0.5}{}_{0.1ml}$. Dilution was carried out in sterile Phosphate Buffer saline, containing 100 units of penicillin and 200mg streptomycin per ml. The air sac area of each egg was disinfected with 70% alcohol, and its margin, identified using a candling lamp, was marked in pencil. A hole was drilled 4 mm above the air sac margin line, and 0.1ml of innoculum discharged in the lateral area of the allantoic cavity, using a needle thrust down vertically through the hole in the shell. (Alexander D.J., 2010)

Incubation and Screening

Each egg was then resealed using melted paraffin wax and incubated at 37degC for a period of 78 hours, kept precisely the same for all batches of eggs. After 24 hours, candling was used to screen all the embryos for non-specific mortality and all dead embryos were discarded. At the end of the 78 hour incubation period the batches of eggs were chilled overnight at 4degC.

Fluid Removal

For removal of fluids for analysis, each batch of eggs was allowed to regain room temperature in a dry, humidity controlled, atmosphere. The top of each egg was once again sterilized with 79% alcohol, and the shell over the air sac removed with forceps, as also was the shell membrane. Allantoic and amniotic fluids (AAF) were collected and pooled for each of the subgroups of 40 eggs from each group of 200 eggs, incubated for their specified 78 hour time periods.

Fluid Analysis: HA Titration

For each batch of 40 eggs, the volume of pooled AAF was measure and hemagluttination (HA) titration carried out as follows.

50□l of sterile normal saline was distributed to each of the required number of wells in a round bottom microtitre plate with a micropipette.

50□l of the AAF was then titrated into the first well with a micropipette, and the well mixed thoroughly 5 times.

50□l of the contents of the first well was then transferred to the second well, which was similarly shaken thoroughly as in (2).

This procedure was repeated to obtain all dilutions of virus up to the required value, normally 1:2048 = 2^{-11}.

Next, 50□l of 1% pooled chicken red blood cell (RBC) suspension was micropipetted into each well, and well mixed by gently shaking the plate backward and forward and from side to side.

Saline control wells were also prepared using 50□l saline + 50□l RBC suspension, as were RBC suspension controls using 100□l RBC suspension.

The well plates were then incubated at 25degC for 35-40 mins.

Results of Incubation were analyzed by observing the distinct patterns formed by the realignment of red blood cells, reading each well either directly from the top or by holding a mirror over the top and reading from the side.

(a) Control wells, RBC cells settle to the bottom forming a sharply outlined disk

(b) Intermediate reaction consists of irregular clumps of cells associated with a hollow of finely aggregated cells.

(c) Maximum, or complete, agglutination is characterized by a uniform salmon-pink film covering the bottom of the wll.

The Titration End Point was taken as the highest dilution of virus suspension producing maximum agglutination.

APPENDIX A5: EXPERIMENT 5

RE: SECTION 7.3 BT VIRUS VACCINE PRODUCTION

Bluetongue Virus: serotype BTV-23, isolated and maintained at IAH&VB, Bangalore. (Daniels P., 2010)

Cell Culture System: BHK_{21}-C13 (Baby Hamster Kidney clone-13) cells available at IAH&VB, Bangalore.

Cell Culture Media: Cell line propagation and maintenance used Eagle's dehydrated medium with L-glutamine, procured from Gibco-BRL®, USA. 1X medium was prepared according to manufacturer's directions in Milli-Q water; pH adjusted to 7.2 using CO_2, sterilized by membrane filtration using 0.22µm filter membranes; and stored at 4˚C.

Growth medium: prepared fresh at time of sub-culturing by adding 7% foetal bovine serum (FBS) procured from Biological Industries®, Israel.

Maintenance medium: prepared at the time of infection without serum.

Microtiter plates: Virus titration and propagation, was performed in 8 row x 12 column, 96 well, plate tissue culture plates procured from Nunc®.

Micropipettes: cells and virus were added to tissue culture plates using Finn Pipettes®: 200-µl and 1000-µl single channel for cells, and 300-µl x 6-channel for virus.

Virus dilution: 100 µl virus, serially diluted 10 fold 10^{-0} to 10^{-9} in maintenance medium were added to each of the first 6 wells of successive plate columns; the final two wells, 7 & 8, contained virus control (neat virus + media) and cell control (cells + media). Both monolayer and co-cultivation methods used this procedure.

Virus titration, Co-cultivation method: 100 µl of a BHK21 cell suspension ($3x10^5$ cells per ml) harvested from a milk dilution (MD) was placed in each well of the 96 well (8 rows x 12 columns) tissue culture plates. Virus addition was then performed as described above; the plate was covered, sealed with cellotape, and incubated at 37°C and 5% CO_2 level. Media were changed as and when required by changes of medium pH.

Virus titration, Monolayer infection method: BHK21 cell monolayers were prepared in 96-well tissue culture plates by adding 100 µl of cell suspension prepared as described, and incubated in the CO_2 incubator, allowing the cells to settle and a monolayer to form. When monolayer confluence was about 60%, cells were prepared for infection as follows: growth media from the wells was discarded, and the cell monolayer was washed twice with maintenance medium. Following infection with virus as described previously, the plate was covered tightly and incubated at 37^0C in a CO_2 incubator maintaining 5% CO_2 level

In both methods wells were observed for the presence or absence of the characteristic 'cytopathic effect' (CPE). The number of wells showing CPE was recorded and the dilution end point as the point where at least 50% of wells show the CPE. The $TCID_{50}$ is calculated using the proportionate dișțance of the dilution end point formula as follows.

$TCID_{50}$ = Negative log of 50% titer = negative log of last dilution above 50% mortality + PD

$$\text{Proportionate distance (PD)} = \frac{\text{\% mortality next above 50\% - 50}}{\text{\% mortality next above 50\% – \% mortality next below 50\%}}$$

APPENDIX A6: EXPERIMENT 6

RE: SECTION 8.4 AVIAN REO VIRUS IMMUNORESPONSE

Avian Reocirus Antibody Test Kit

METHODS OF USE

The Pro FLOK REO ELISA Kit is a rapid serologic test for the detection of REO antibody in chicken serum samples. The test was developed to detect chicken REO antibody levels pre/post vaccination. The assay measures REO antibody bound to REO antigen coated plates. Its principle is as follows: Serum obtained from chickens exposed to Avian REO virus contains specific anti-REO antibody serum. Diluted in Dilution Buffer, it is added to REOIG antigen coated plates. REO-specific antibody in the serum forms an antibody-antigen complex with the REO antigen bound to the plate. After washing the plate, an affinity purified goat anti-chicken IgG (H+l) peroxidase conjugate is added to each well. Antibody-antigen complex remaining from the previous step binds with the conjugate. After a brief incubation period, the unbound conjugate is removed by a second wash step. Substrate containing a chromogen (ABTS), is added to each well. Chromagen color change (from clear to green-blue) occurs in the presence of peroxidase enzyme. The relative intensity of color developed in 15 minutes (compared to antibody in serum). After the substrate has incubated, Stop Solution is added to each well to terminate the reaction; each plate is then read using an ELISA plate reader at 405-410nm.(Synbiotics Corporation Manual)

REAGENTS REQUIRED FOR 90 TESTS

a) 1 REO antigen coated plate

b) 10 µl REO Positive Control serum

c) 10 µl Normal control serum (NCS)

d) 100 µl Goat anti-Chicken IgG (H+L) Peroxidase 40ml Dilution Buffer

e) 40ml Dilution Buffer

f) 10ml ABTS-Hydrogen Peroxide Substrate Solution

g) 2.5 ml ABTS-Hydrogen peroxide Substrate solution

h)20 ml 20x Wash Solution (dilute (1.5) with laboratory grade water)

NOTE: Store all reagents provided in the kit at 2.7^0C.

a) High precision pipette (i.e 1-20 µl pipette)

b) 0.2 ml, 1.0 ml and 5.0 ml pipettes

c) 8 or 12 channel pipette (or translating device)

d) 2 graduated cylinders (50ml)

e) Uncoated low binding 96 well plates (Nunc catalog #269620)

f) Laboratory grade (Distilled or R.O.) Water

g) 96 well plate reading ELISA spectrophotometer with 405-410 nm filter

h) Plate washing apparatus

SAMPLE DILUTION PROCEDURE

Dilute serum samples using Dilution Buffer in a clean, uncoated 96 well microtiter plate. Set up sample and controls as shown in Figure1.

PREPARATION OF THE SERUM DILUTION PLATE

A) Add 300 µl dilution buffer to each well of an uncoated 96 well microtiter plate, the 'serum dilution plate'.

B) Add 6 µl known serum per well as per Figure 1 (yielding 1:50 dilution) starting with well A4 and ending with well H9, moving left to right, row by row.

C) Add 6µl Normal Control Serum (again 1:50 dilution) to wells A2, H10 and H12.

D) Aspirate and remove any liquid in dilution plate wells A1, A3 and H11.

E) Allow all diluted serums to equilibrate in Dilution Buffer for 5 mins, then transfer to ELISA plate.

F) Test Diluted serum within 24 hours:

Preparation of REO Positive Control: Use REO Positive Control Serum provided with kit.

Dilute appropriate volume with Dilution Buffer (1:50) in separate clean 5 ml test tubes e.g.

dilute 6µl of positive control serum in 300 µl Dilution Buffer. Mix well.

Preparation of Conjugate Solution: The horseradish peroxidase conjugated anti-chicken IgG (H+L) is supplied in HRP Stabilizer. Dilution 100µl stock conjugate in 10 ml preparation well is sufficient conjugate for one 96-well ELISA plate

Preparation of 1X Wash Solution: Dilute 20ml Concentrated Wash Solution in 380ml laboratory grade (distilled or RO) water (1:20). Mix well.

N.B.: any white solid to be dissolved by warming Stop Solution to room temp or 37^0C before use.

ELISA TEST PROCEDURE

PREPARING THE TEST PLATE

A) Remove a REO antigen test plate from the protective bag and label according to dilution plate identification

B) Add 50ul Dilution Buffer to all wells on the test plate

C) Add 50ul diluted REO Positive Control serum to wells A1, A3 and H11. Discard Pipette tip.

D) Using an 8 or 12 channel pipette, transfer 50ul /well of each of the diluted serum samples and Narmal Control Serum samples from the dilution plate to the corresponding wells of the REO coated test plate. Discard pipette tips after each REO Coated test plate. Discard pipette tips after each row of sample is transferred. Transfer samples to the ELISA Plate as quickly as possible.

E) Incubate plate for 30 minutes at room temperature

WASH PROCEDURE

F) Tap out Liquid from each well into an appropriate vessel containing bleach or other decontamination agents containing bleach or other decontamination agent

G) Using an 8 or 12 channel pipette (or Comparable automatic washing device), fill each well with approximately 300ul Wash Solution. Allow to Soak in wells for 3 minutes: then discard

contents into an appropriate waste container (waste container should contain bleach solution) Tap inverted plate to ensure that all residual liquid is removed. Repeat wash procedure twice more.

NOTE: The wash procedure is a very critical step in any ELISA Procedure. Follow above steps.

ADDITION OF ANTI-CHICKEN IkG PEROXIDASE CONJUGATE,

h) Using an 8 or 12 channel pipette (or transplating device) dispense 100 µl diluted conjugate (prepared as described above) into each assay well. Discard pipette tips.

i) Incubate for 30 minutes at room temperature

j) Wash as in step f and g above.

K) Using an 8 or 12 channel pipette (Or Transplating device) Dispense 100 µl Substrate solution into each test well Discard pipette tips.

L) Incubate for 30 minutes at room Temperature.

M) Using 8 / 12 Channel pipette (or transplating device) add 100µl diluted Stop Solution to test wells.

N) Allow bubbles to dissipate before reading plate.

MANUAL PROCESSING OF DATA

A) Read the plate using an ELISA plate reader set at 405- 410nm. Be sure to blank the reader as directed.

B) Calculate the average Positive Control serum absorbance (Optical Density (O.D) using the absorbance values of wells Al,A3 and H11. Calculate the average Normal Control Serum absorbance using values obtained from wells A2, H10 and H12 Record both averages.

C) Subtract the average normal control absorbance from the average positive control to obtain corrected positive control (CPC).

D) Calculate the sample to positive (S:P) ratio by subtracting the average normal control absorbance from each sample absorbance. The difference is divided by the CPC. Use the following equation:

sp = (Sample Absorb)-(Average Normal Control Absorbance)/CPC

K) Using an 8 or 12 channel pipette (Or Transplating device) Dispense 100 ul Substrate solution into each test well Discard pipette tips.

L) Incubate for 30 minutes at room Temperature.

M) Using an 8 or 12 Channel pipette (or transplating device) add 100ul diluted stop Solution to each test well.

N) Allow bubbles to dissipate before reading plate.

RESULTS(Assay Control Values)

REO ELISA results are valid when the average optical density (O.D) value of the Normal Control Serum is less 0.250 and the Corrected Positive Control (CPC) value range is between 0.250 and 0.900. If either is out of range, the REO Test results should be considered invalid and samples should be retested. Samples with sp value less than or equal to 0.150 receive a 0 titer value, and are considered negative for REO antibody.

Under optimal conditions, suggested O.D value ranges are 0.060 to 0.080 for REO normal control serum, and 0.400 to 0.800 for REO positive control serum.

Should be strived for to ensure the most consistent laboratory test results. N.B. test results with O.D values outside the suggested O.D ranges do not constitute invalid tests.

Optimal conditions are room temperature ($70\text{-}75^0$.F = $21\text{-}24^0$C) Higher room temperature may result in slightly higher OD Values.

Interpretation of Results

REO ELISA titre values obtained compare REO antibody levels within each field chicken serum with REO ELISA kit positive and normal control sera. Therefore, it is important to first determine that the REO ELISA kit positive and normal control sera values obtained are valid as detailed above in the "Assay Control Values" Section above, before REO ELISA results are interpreted

A "0" REO ELISA titer represents a chicken serum sample that contains an extremely low to insignificant REO Antibody level compared sera. A REO ELISA titer value above "0" indicates only that that chicken serum sample contains a significant and ELISA-detectable REO antibody level compared to the REO ELISA kit positive and normal control sera. However, these titers do not imply or ensure "protection" nor provide serologic differentiation between a REO vaccine response or REO field infection.

Optimum REO vaccine administration practices and "protective" flock REO titer target values must be determined by each REO ELISA kit user by comparing flock pre and post vaccination REO ELISA results (i.e. coefficient of variation %CV), and geometric mean titer (GMT) values) with flock performance parameters (i.e. morbidity, mortality, flock body weight gain or uniformity) over time (Olson, N.O, 1978) (Snyder,DB., 1984)

APPENDIX B

Rāhu and Ketu, Eclipses and the Rāhukāla Time Concept

***Rāhu* and *Ketu*: *Jyotiṣa* Grahas**

Rāhu and *Ketu* are two of the nine '*grahas*' named in *Jyotiṣa*, major factors influencing events on earth. The name, *Rāhu*, has the literal meaning, 'seizer', whilethe name, *Ketu*, means 'bright appearance', 'clearness', or 'brightness'. Technically, *Rāhu* and *Ketu* are the points where the moon's orbit crosses the ecliptic, the line of the sun's apparent motion round the earth. *Rāhu*, known as the North node, or 'ascending node', lies where the moon crosses from south to north. *Ketu* is the opposite point where the moon crosses from north to south, the South node, or 'descending node'. Even though *Rāhu* and *Ketu* are not physical bodies, they are 'sensitive points' on the ecliptic, close to which eclipses are possible.

Eclipses occur when the moon's shadow falls on the earth (solar eclipse), or when earth'shadow falls on the moon (lunar eclipse). This can only happenwhen Sun, Moon and Earth are close to a straight line i.e. Sun is close to '*Rāhu*' or '*Ketu*'. At other points on the ecliptic, the angle between the lines of earth and sun, and earth and moon, mean that earth and moon avoid each other's shadows.

Rāhu and *Ketu* are not fixed points in the sky. Instead, due to gravitational effects of the sun on the moon's orbit, and to a minor extent Jupiter and other planets, they precess backwards round the ecliptic, i.e. in the opposite direction to the motion of the planets, about once every 18.7 years. Their motion is not constant, but is maximum when their direction is at right angles to the sun, and almost stationary for periods of a month or so when the sun moves close to their direction, and eclipses can take place.

Jyotiṣa holds that *Rāhu* is inauspicious and fierce, generallyexertingmalefic, mischievous and tamasic influences. For those born under his direct influence, for example by his presence in

their birth chart *Ḻagna*, a condition called *sarpa doṣa* , *Rāhu*'s influence produces extremely unlucky effects persisting throughout life. Such persons are said to find no inner peace, to be exposed to enemies, and deprived of their wisdom, riches and children.

Rāhu produces such influences in many ways: a *Rāśi* can be influenced by his presence or aspect, or association with its Lord. A *graha* can be influenced by being conjunct with, or aspected by *Rāhu*, or his presence in one of its *Nakṣatras* or *Rāśis*. Finally, each week day has a period called '*Rāhukāla*',inwhich *Rāhu's*influence is maximum. (Trimedi P., 2005)

B.1 Mythology of Rāhu: Traditionally, subtle influences like*Rāhu*'s were explained in stories. The Vishnu Purana (Chaturvedi B.K, 2006) tells of *Rāhu*'s origin as a four-armed, dragon-head demon called *Svarabhanu*, said to be a great mischief-maker, and represented as a black man riding a horse. When, under *Mahalaxmi*'s instruction, *amrita* arose from churning of the milk ocean, and was distributed to the Devas waiting in line to receive it, *Svarabhanu* disguised himself and joined them. The sun and the moon detected his mischief and reported it to Lord Vishnu, who immediately cut off *Rāhu*'s head with his discus (*Sudarshan chakra*). Too late, however! *Svarabhanu* had imbibed some of the nectar, and become immortal: his head became the demon *Rāhu*, while his body became *Ketu*. These, possessing opposite qualities, were placed one hundred and eighty degrees apart in the stellar sphere.

Rāhu continues to cause mischief, creating despair and disbelief, but *Ketu*, being opposite in nature, exerts a powerful spiritualizing influence, aiding enlightenment. *Rāhu* is said to traverse the heavens in his eight-horsed chariot, constantly trying to devour the sun and moon for having denounced him. Whenever he succeeds in whole or in part, an eclipse occurs.*Rāhu* was thus considered the cause of eclipses, while*Ketu*was thought of more as a comet giving birth to other comets (also thought 'inauspicious').Decoding traditionaldescriptionsof *Jyotiṣa* influences makes it possible to predict effects of different *grahas* such as *Rāhu*.

***Graha* Influences**: Influences predicted by *Jyotiṣa* can be compared to other, well-accepted, unseen influences on human function and human health. All beings are constantly subject to various kinds of interaction with their environment, occurring on both gross and subtle levels. All living beings require food and nourishment; humans interact socially and professionally in myriad ways, undertaking activities and projects of all kinds. At less manifest levels, subtle influences bombard our systems. Many affect our health: 50 cycle frequencies from overhead power lines (Toledano M., 2007); electric charges generated by storms, or born on winds like the Swiss Foehn (Kerr K.G, 2006) microwave energies from mobile phones (Klaeboe L, 2007); cosmic rays from space (Cucinotta F.A, 2006)

Jyotiṣa holds that similar unseen influences are produced by the nine *grahas* as they move from division to division of the ecliptic and from astrological house to astrological house as earth rotates. They constantly affect our systems in positive and negative ways (Parashara M., 1994). Every time division influences our health in ways specific to the constitution of our souls''time-space machines', (*Jivatma*) (Bhishnagrata.K.L.,1963) (Frawley,D.,2007) More specifically, *Rāhu*'s influence is to reduce quality of life and health, by inhibiting organism protection processes. As a shadowy planet, *Rāhu* creates a certain mystery or unpredictability,giving rise to problems with hidden causes, and creating cloudy kinds of disturbance: in medicine, infections, particularly by viruses.Here, we hypothesize that it slows growth and inhibits immune response in all organisms.

B.2 Rāhukāla: Certain time periods have effects independent of the positions of the *grahas*. *Rāhukāla*is one such. [116]*Rāhukāla* falls at times specific to the day of the week (see Table 9), and is held to be particularly inauspicious. So well-known is *Rāhukāla,* and its effects so widely subscribed to, that its times are usually printed on Indian calendars and office diaries. Even today, many in Indian culture are hesitant to start any activity while *Rāhukāla* lasts – approximately 1½ hours. Long tradition holds that when any important venture or activity is

being undertaken, such as business dealings, buying and selling investments, travel, meeting people or medical treatments, starting times during *Rāhukāla* time periods should be avoided.

Table 9.0 gives *Rāhukāla*'s approximate times, and how tocalculate them exactly as a specific 8th portion of the daylight hours between sunrise and sunset. Correct calculation of the exact time of *Rāhukāla* for a particular day and place requires knowing exact times of sunrise and sunset: divide the exact time period between sunrise and sunset eight equal portions, andlabel them 1 to 8. The particular 8thportion designated *Rāhukāla* on each of the seven days of the week is given in **Table 9.0**. Approximate times can be used when accurate *Rāhukāla* times are not available; they are exact only on the equator, or at an equinox, when daytime lasts precisely 12 hours, and in places where sunrise is exactly 06.00 am. As earth rotates, the afflicted *Rāhukāla* zone moves round the earth from the date line, ending there 24 hours later.

Those not knowing about *Rāhukāla* are more likely to fail in their undertakings despite exerting their best efforts. Whether an investment or a major purchase is to be made, some new endeavor initiated, a journey started, or a meeting with an old friend– whatever it may be, new or important or of value, it should cease during *Rāhukāla*. Even medical treatments, no matter how urgent, should not be performed during Rāhukāla. Otherwise, they may cause a patient more harm than benefit. At least one hospital in Kerala has already adopted this strategy, and the public accepts it.

According to Āyurveda , *Rāhu*'s influence produces *Vata*aggravated physical and mental traits, resultingin weakened immune systems and disease susceptibility (Kerr K.G, 2006) One of *Jyotiṣa*'s main biological predictions is therefore that *Rāhu*'s influence will weaken immune response, the rationalebehind the experiments testing immune response in birds and animals, and increased viral propagation in cell cultures.

B.3 Scientific Experiments Testing the *Rāhukāla* Concept

The very general nature of *Rāhukāla* makes it easier to test than other *Jyotiṣa* predictions. Two identical actions, one started during *Rāhukāla,* and the other at an auspicious time on the same day, are predicted to yield different results, that will constitute an empirical test of the *Rāhukāla* concept, provided that no other valid reason can be given for the differences, either scientific, eg due to diurnal biorhythms, or astrological.

Research reported here is the first to testpossible influences of *Rāhu*, including the time period *Rāhukāla*, on microbiological processes, by selecting starting time *muhūrtas* during *Rāhukāla* time periods, and under other *Rāhu* influences. The thesis's main sections report results of tests of *Guru graha* and *Rāhu* influences, including *Rāhukāla*, strongly suggesting that *Rāhu* exerts microbiological effects, inhibiting cell growth and resistance to infection.Indications aretherefore that both the *muhūrta*[127]and *Rāhukāla*concepts can be scientifically tested in many kinds of biological experiment.

Data fromour experiments has also led to new experimental hypotheses, which require testing to greater levels of significance in further experiments:

(1) The effects of strong moon and *guru* can both protect against, or even reverse, the influence of *Rāhu*,

(2) Each influence in a *Kundali* is stronger at the time of its inception, and weakens thereafter.

Also, Chapter 8reports a global influence of eclipses on the biosphere. In future, possible similar global influences due to *Rāhukāla* should be tested at those particular times of the week when *Rāhukāla* may be completely absent or doubly present.

More generally, our experiments suggest that, during *Rāhukāla*, Nature undergoes a type of modulation in which different kinds of subtle chemicals and other factors are produced, inhibiting or even blocking important cellular processes, slowing normal cell functionand cell

propagation: for example through errors in, oreven failure of, protein synthesis. Cells may exhibit failure in production traits or resistance to pathogens. In humans tendencies toward wrong notions and impaired physiological function may result.

Due to these inhibitory influences, normal metabolism and other physiological processes may be compromised during *Rāhukāla*, and, if unwanted demands are made on the system, fail to fulfil their responsibilities. Any action may yield undesirable results if initiated during this time period, which is thus considered 'inauspicious'. Corresponding effects may also arise from the environment, because one influence of Rāhukāla is to inhibit coordination of sensory and motor functions, and thus natural perception of, and response to, possible dangers e.g. if a person is in danger of an unpleasant event, like a robbery or an accident, it is more likely to occur during Rāhukāla. Individuals knowing about such dangers do better to remain in secure conditions, biding their time before proceeding until the Rāhukāla time period is over.

Extras 1: In this context, three scientific experiments have been carried out testing the effect of Rāhukāla on pathology resistance and growth in eukaryotic cells. The first experiment (Rameshrao N, 2013b) tested pathology resistance using a standard model of Blue Tongue viral infection of Baby Hamster Kidney cancer (BHK_{21} C-13)) cells. Infection was carried out comparing the possible influence of Rāhukāla with Tula *l̤agna* (rising sign), the experimental hypothesis being that cell resistance to infection would be weakened during *Rāhukāla*. The second experiment evaluated growth of the anaerobic bacterium *Clostridium Chauvoie* for different starting times for standard vaccine production protocols (Rameshrao N, 2013b) .The third experiment measured Raniket virus production in chicken embryos, again for various starting times in standard vaccine production protocols (Rameshrao N, 2013a) Experiments one and two were carried out at IAH&VB vaccine institute, while experiment three was conducted at the Vesper company laboratories in Bangalore. An outline of these experiments follows; detailed protocols are given elsewhere (Rameshrao N, 2013a) (Rameshrao N, 2013b).

Extras 2: As regards the credibility of these experiments, (Rameshrao N, 2013a) (Rameshrao N, 2013b), the statistics have been exhaustively analyzed The usual scientific position on astrology is that of the scientific skeptic, namely that no astrological or similarly based prediction can possibly be valid (Weinberg S.,1992) The null hypothesis in any experimental test of *Jyotiṣa* is thus identical with the skeptical position which may be summarized as:

whatever astrological or other occult influences are predicted for an experiment,

no systematic differences should ever be seen for otherwise identical conditions.

Any broken null hypothesis for predicted differences counts against the skeptic position. Two way experiments of the kind reported are therefore a more stringent test of scientific skepticism than of *Jyotiṣa* – because *Jyotiṣa* makes a myriad of predictions all of which require independent quantification. Skepticism on the other hand makes a single strong, and therefore easily tested, prediction: *no significant results, ever*. Limited though they are, the above experiments offer strong empirical evidence against it,

The basic reason why skeptics exclude astrology so strongly is that no acceptable theory has been formulated consistent with known scientific theories, which can predict phenomena of an astrological nature. At least none has yet been published in the scientific literature. Skeptics tacitly interpret this fact as implying that such a theory is impossible, as is widely held to be the case for astrology. The side that any scientist chooses to adopt on this issue is clearly a matter of personal taste, but many if not most scientists regard the possibility of astrology having any substance as being so tiny as not to be worth the potentially wasted effort (Weinberg S., 1992).

In this context, the implied influence of Rāhu on immune function may be of significance, because immune system function is known to be regulated by a series of extremely sensitive triggers that can result in classic 'butterfly's wing' like effects. That is to say, a tiny, almost inconceivably small, input influence can produce a huge difference in response, either in kind or magnitude. In keeping with this, immune responses in macrophages are now known to exhibit criticality (Nitker M., 2008), a kind of

regulatory functioning proposed by various authors (Bak P., 1993) (Hankey A., 2005), subject to influence by quantum correlations.

Astrological predictions do indeed take the form of correlations: correlations between planetary positions and various probabilistic influences on a person's experiences and behavior, including conditional influences, all reminiscent of quantum correlations. The possibility that astrological influences could be mediated by large scale quantum correlations – if such could be generated by astrophysical processes – is therefore doubly attractive. (Hankey A., 2013).

Conclusions

The striking results obtained from the summarized experiments indicate that Rāhukāla has an influence on the biological systems investigated. Possible underlying mechanisms should therefore now be explored by further application of the time-space effects brought to light. Further research is required, if possible on simpler biological systems, and at more closely spaced time intervals.

In particular, the experiments indicated that severe Rāhu influences are not limited only to Rāhukāla and that those who wish to protect themselves against Rāhu's influence may also need to consider time periods when, (a) Chandra is in a Rāhu Nakṣatra, without any protecting influence, (b) *Ḻagna* contains Rāhu, (c) *Ḻagna* time is under a Rāhu influence, such as (i) falling in a Rāhu Nakṣatra, (ii) Rāhu aspecting *Ḻagna* (iii) Rāhu with Lord of *Ḻagna*, or (iv) Rāhu aspecting Lord of *Ḻagna*, and (d) Rāhu in or aspecting Moon sign (Rāśi) without protecting influence.

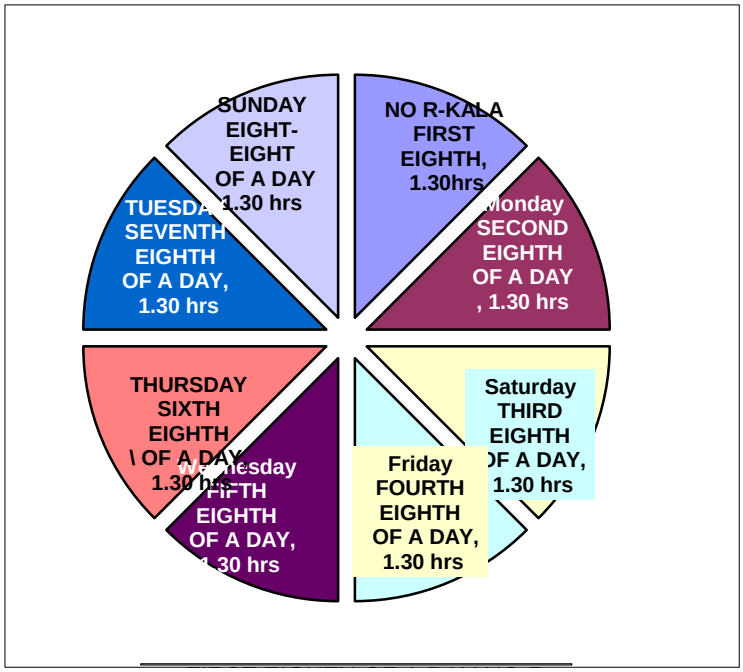
TABLE B1

TIMES OF RĀHUKĀLA ON EACH DAY OF THE WEEK

Day of Week	Portion	Approximate Time Period
Sunday	8	16.30 – 18.00
Monday	2	07.30 – 09.00
Tuesday	7	15.00 – 16.30
Wednesday	5	12.00 – 13.30
Thursday	6	13.30 – 15.00
Friday	4	10.30 – 12.00
Saturday	3	09.00 – 10.30

Table B1: approximate times of *Rāhukāla*.Its exact time each day is the specific 8th portion of the daylight hours between sunrise and sunset given in the Table. Correct calculation of the exact time of *Rāhukāla* for a particular day and place therefore requires knowing exact times of sunrise and sunset

Figure B.1 Day of the Week *Rāhukāla* Chart



APPENDIX C

SHEEP AND GOATS VACCINATION DATA

TABLE C1: GOATS RAW DATA

Chellekere Farm, Chitradurga District 02.12.2007

Goats PPR Vaccination - Chellekere Farm 02.12.2007										
sl no	*Dhanur Lagna*				sl no	*Makara Lagna*				
	ANI-NO	TIME	0day	21day		ANI-NO	TIME	0day	21day	
1	124	7.52.AM	0.57	0.23	1	8419	10.21am	0.49	0.46	
2	142	7.55.AM	0.65	0.41	2	127	10.21.30AM	0.53	0.43	
3	8403	8.04AM	0.60	0.32	3	8436	10.23AM	0.51	0.38	
4	170	8.07AM	0.60	0.51	4	193	10.23.30AM	0.53	0.29	
5	200	8.15AM	0.62	0.41	5	8410	10.25AM	0.49	0.46	
6	162	8.18AM	0.55	0.30	6	4875	10.25.30AM	0.59	0.32	
7	198	8.27AM	0.57	0.27	7	146	10.27AM	0.52	0.43	
8	126	8.30.AM	0.64	0.27	8	192	10.27.30AM	0.59	0.59	
9	197	8.39AM	0.57	0.34	9	149	10.29AM	0.48	0.27	
10	166	8.42AM	0.61	0.22	10	150	10.29.30AM	0.46	0.42	
11	134	8.51AM	0.48	0.25	11	148	10.31AM	0.58	0.25	
12	8406	8.54AM	0.60	0.32	12	144	10.31.30AM	0.49	0.48	
13	164	9.03AM	0.60	0.55	13	145	10.33AM	0.49	0.16	
14	3922	9.06AM	0.54	0.20	14	165	10.33.30AM	0.49	0.49	
15	168	9.15AM	0.53	0.51	15	169	10.35AM	0.48	0.38	
16	199	9.17AM	0.52	0.44	16	141	10.35.30AM	0.42	0.32	
17	196	9.23AM	0.46	0.21	17	2118	10.37AM	0.49	0.49	
18	195	9.25AM	0.48	0.41	18	205	10.37.30AM	0.43	0.40	
19	121	9.31AM	0.50	0.28	19	118	10.39AM	0.50	0.25	
20	143	9.33AM	0.53	0.50	20	272	10.39.30AM	0.55	0.52	

TABLE C2: SHEEP RAW DATA

Chellekere Farm, Chitradurga District 02.12.2007

Sheep PPR Vaccination - Chellekere Farm 02.12.2007										
sl no	*Dhanur Lagna*				sl no	*Makara Lagna*				
	ANI-NO	TIME	0day	21day		ANI-NO	TIME	0day	21day	
1	113	7.58.AM	0.67	0.34	1	225	10.22AM	0.53	0.32	
2	101	8.01AM	0.64	0.23	2	230	10.22.30AM	0.56	0.41	
3	103	8.10AM	0.50	0.25	3	226	10.24AM	0.45	0.45	
4	207	8.13.AM	0.66	0.33	4	203	10.24.30AM	0.50	0.50	
5	279	8.21AM	0.57	0.42	5	110	10.26AM	0.56	0.35	
6	277	8.24AM	0.61	0.51	6	8438	10.26.30AM	0.54	0.18	
7	237	8.33AM	0.62	0.16	7	117	10.28AM	0.51	0.43	
8	106	8.36AM	0.63	0.45	8	210	10.28.30AM	0.50	0.49	
9	274	8.45AM	0.62	0.45	9	108	10.30.00AM	0.49	0.48	
10	278	8.48AM	0.65	0.33	10	222	10.30.30AM	0.48	0.48	
11	206	8.57AM	0.63	0.50	11	240	10.32AM	0.45	0.36	
12	202	9.00AM	0.55	0.41	12	8434	10.32.30AM	0.50	0.50	
13	4206	9.09AM	0.48	0.14	13	209	10.34AM	0.44	0.39	
14	105	9.12AM	0.55	0.23	14	107	10.34.30AM	0.43	0.26	
15	123	9.19AM	0.53	0.45	15	115	10.36AM	0.55	0.51	
16	223	9.21AM	0.59	0.19	16	221	10.36.30AM	0.47	0.47	
17	224	9.27AM	0.49	0.19	17	275	10.38AM	0.46	0.34	
18	114	9.29Am	0.49	0.33	18	250	10.38.30AM	0.48	0.39	
19	218	9.35AM	0.51	0.15	19	8494	10.40.00AM	0.44	0.13	
20	8447	9.36AM	0.69	0.35	20	229	10.40.30AM	0.44	0.36	
21	273	9.37AM	0.57	0.47						

TABLE C3: SHEEP & GOATS CONTROL GROUP

Chellekere Farm, Chitradurga District 02.12.2007

Control Group for Sheep & Goat Chellekere Farm 02.12.2007					
	SHEEP - CONTROL GROUP				
1	SHEEP	4338	10.43AM	0.67	0.60
2	SHEEP	4995	10.46AM	0.59	0.59
3	SHEEP	8500	10.49M	0.49	0.49
4	SHEEP	4328	10.52AM	0.49	0.46
5	SHEEP	3742	10.54AM	0.57	0.53
6	SHEEP	1977	10.59AM	0.52	0.52
7	SHEEP	8424	11.02AM	0.46	0.46
8	SHEEP	253	11.05AM	0.54	0.53
9	SHEEP	266	11.14AM	0.48	0.47
10	SHEEP	281	11.16AM	0.63	0.61
11	SHEEP	238	11.18AM	0.49	0.48
12	SHEEP	228	11.22AM	0.41	0.40
	GOAT - CONTROL GROUP				
1	GOAT	130	11.09AM	0.44	0.40
2	GOAT	102	11-12AM	0.61	0.58
3	GOAT	182	11-24AM	0.61	0.58
4	GOAT	4822	11.26AM	0.42	0.42
5	GOAT	171	11.29AM	0.43	0.41
6	GOAT	161	11.31AM	0.45	0.44

TABLE C4: SHEEP RĀHUKĀLA DATA

Chellekere Farm, Chitradurga District 02.12.2007

	Sheep & Goat RahuKala Vaccination Chellekere Farm 02.12.2007					
1	**SHEEP**	**501**	11-11.25AM	0.73	0.53	
2	**SHEEP**	**502**	11-11.25AM	0.74	0.61	
3	**SHEEP**	**503**	11-11.25AM	0.77	0.54	
4	**SHEEP**	**504**	11-11.25AM	0.81	0.64	
5	**SHEEP**	**505**	11-11.25AM	0.68	0.64	
6	**SHEEP**	**506**	11-11.25AM	0.84	0.69	
7	**SHEEP**	**507**	11-11.25AM	0.78	0.45	
8	**SHEEP**	**508**	11-11.25AM	0.83	0.61	
9	**SHEEP**	**509**	11-11.25AM	0.70	0.45	
10	**SHEEP**	**510**	11-11.25AM	0.72	0.52	
11	**SHEEP**	**511**	11-11.25AM	0.73	0.66	
12	**SHEEP**	**512**	11-11.25AM	0.70	0.55	
	CONTROL - GROUP					
1	**SHEEP**	513	10AM -11AM	0.69	0.66	
2	**SHEEP**	514	10AM -11AM	0.59	0.58	
3	**SHEEP**	516	10AM -11AM	0.60	0.59	
4	**SHEEP**	517	10AM -11AM	0.68	0.68	
5	**SHEEP**	518	10AM -11AM	0.58	0.57	
6	**SHEEP**	519	10AM -11AM	0.85	0.84	
7	**SHEEP**	520	10AM -11AM	0.90	0.88	
8	**SHEEP**	521	10AM -11AM	0.71	0.67	
9	**SHEEP**	522	10AM -11AM	0.75	0.75	
10	**SHEEP**	523	10AM -11AM	0.61	0.57	
11	**SHEEP**	524	10AM -11AM	0.77	0.76	
12	**SHEEP**	525	10AM -11AM	0.75	0.73	

TABLE C5: SHEEP RAW DATA

Dhangur Farm, Mandya District 19.09.2008

PPR VACCINATION IN BANNUR SHEEP IN DHANGUR FARM 19.09.2008										
sl no	*Dhanur Lagna*				sl no	*Makara Lagna*				
	ANI-NO	TIME	0day	21day		ANI-NO	TIME	0day	21day	
1	26091	12.45-1.5pm	0.68	0.34	1	26075	3.0-3.20pm	0.70	0.68	
2	26092	12.45-1.5pm	0.72	0.61	2	26076	3.0-3.20pm	0.71	0.64	
3	26093	12.45-1.5pm	0.81	0.74	3	26077	3.0-3.20pm	0.58	0.57	
4	26094	12.45-1.5pm	0.77	0.40	4	26078	3.0-3.20pm	0.73	0.64	
5	26095	12.45-1.5pm	0.77	0.40	5	26079	3.0-3.20pm	0.81	0.65	
6	26096	12.45-1.5pm	0.90	0.39	6	26080	3.0-3.20pm	0.75	0.64	
7	26097	12.45-1.5pm	0.86	0.38	7	26191	3.0-3.20pm	0.80	0.61	
8	26098	12.45-1.5pm	0.70	0.27	8	26192	3.0-3.20pm	0.80	0.60	
9	26099	12.45-1.5pm	0.72	0.54	9	26193	3.0-3.20pm	0.79	0.78	
10	26100	12.45-1.5pm	0.80	0.80	10	26194	3.0-3.20pm	0.78	0.38	
					11	26195	3.0-3.20pm	0.61	0.56	
					12	26196	3.0-3.20pm	0.77	0.37	
					13	26197	3.0-3.20pm	0.82	0.63	

TABLE C6: SHEEP RĀHUKĀLA DATA
Dhangur Farm, Mandya District 20.09.2008

PPR VACCINATION IN BANNUR SHEEP IN DHANGUR FARM 19.09.2008										
sl no	Control Group				sl no	Rāhukāla Group				
	ANI-NO	TIME	0day	21day		ANI-NO	TIME	0day	21day	
1	26084	2.0 -2.30PM	0.76	0.76	1	26061	10-10.30AM	0.75	0.68	
2	26085	2.0 -2.30PM	0.79	0.72	2	26062	10-10.30AM	0.72	0.63	
3	26086	2.0 -2.30PM	0.62	0.60	3	26063	10-10.30AM	0.66	0.63	
4	26087	2.0 -2.30PM	0.69	0.67	4	26064	10-10.30AM	0.78	0.65	
5	26088	2.0 -2.30PM	0.77	0.76	5	26065	10-10.30AM	0.76	0.69	
6	26089	2.0 -2.30PM	0.77	0.77	6	26066	10-10.30AM	0.71	0.54	
7	26090	2.0 -2.30PM	0.77	0.76	7	26067	10-10.30AM	0.63	0.63	
8	26071	2.0 -2.30PM	0.69	0.66	8	26068	10-10.30AM	0.76	0.66	
9	26072	2.0 -2.30PM	0.69	0.69	9	26069	10-10.30AM	0.70	0.70	
10	26073	2.0 -2.30PM	0.79	0.77	10	26070	10-10.30AM	0.69	0.59	
11	26074	2.0 -2.30PM	0.71	0.69	11	26081	10-10.30AM	0.73	0.69	
					12	26082	10-10.30AM	0.76	0.62	
					13	26083	10-10.30AM	0.64	0.43	

APPENDIX D

Publications from this Doctoral Thesis

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1. Rameshrao N., Renukaprasad C., Sharma S, Starting-Time Dependence Of Yield In Production Of Raniket Virus Vaccine**, N**atural Variations In Rates Of Microbial Processes May Have Astrological Explanations. Light on Ayurveda Journal, 2013; 11(3): 52.
2. Rameshrao N., Renukaprasad C, Gajendragad M., *Byregowda* S.M. Astromedicine: A Summary of Eight Experiments. Light on Ayurveda Journal, 2013; 11(4): 42.
3. Rameshrao N, Reukaprasad C, Hankey A. The Effect of Solar Eclipse on BT Viral Growth – An Experimental Study. The Wairco Journal "International Journal of Conceptions on Computing and Information Technology" (In Press)
4. Rameshrao N. Hankey, A. Nagendra, H.R Kāla and Mahākāla: Time and The Timeless in the Vedic Literature. International Journal Of Yoga-Philosophy, Psychology and Parapsychology. (In Press)
5. Rameshrao N. Hankey A A New Kind of Biologically Active Orientation-Sensitive Field: Coupling to Complexity Based Biological Regulatory Systems**?** Forschende Komplementärmedizin / Research In Complementary Medicine. 2013; 19(5):/316-319. .

PAPER-1

Starting Time Dependence of Yield in Production of Raniket Virus Vaccine: natural variations in rates of microbial processes may have astrological explanations

by Ramesh Rao N. Suresh Sharma

ABSTRACT

Like all microbial growth processes, viral infections of cell cultures exhibit high variability in output. Viral vaccine production requires constant monitoring of yield and quality. Expertise in *Jyotiṣa* astrology led us to hypothesize that *Jyotiṣa muhurtas influence microbial growth*, and test the hypothesis by assessing differences in vaccine yield for batches started under different *muhurtas*. The experiment reported here monitored Raniket virus vaccine production started at seven different times on a single day: two under *Rāhu*'s influence, one under *Guru*'s, and four neutral. Five batches of 40 Bobcock chicken eggs were infected with Raniket virus at each time. Data agreed well with predictions: for each *muhurta*, all five batches gave the same yield, the two *Rāhu* times giving more than the four neutrals, and the one under *Guru* less. Fisher's permutation test yields $\mathbf{p = 1.07x10^{-11}}$ against the 35 data points falling in such a pattern. With two peaks separated by two neutral batches, simple biorhythm explanations for the results are precluded. Comparing pairs of times yields $\mathbf{p_F}$ = (1/252) = **0.00397** (Fisher's exact test), so null hypotheses give $(\mathbf{p_F})^6 = \mathbf{4x10^{-15}}$ against *Guru muhurta* yielding less vaccine, and $(\mathbf{p_F})^{10} = \mathbf{10^{-24}}$ against the two *Rāhu* columns yielding more. **Conclusion**: favorable *muhurtas* increase Raniket virus vaccine production; natural variance in cell culture experiments may be due to planetary influences, and explicable through *Jyotiṣa*.

INTRODUCTION

The world's farm animals depend for their health on large-scale vaccination programs against viral and bacterial diseases. Otherwise disease decimates herds and flocks alike. Research continues at the highest levels[1]. Examples of commercial scourges include Peste des Petits Ruminants [2]. Bluetongue[1], Black Quarter[3], and Hemorrhagic Septicemia[4,5] in ruminants, and Newcastle disease (Raniket virus) in birds[6-8]. Maintaining national animal wealth requires vaccination programs against all such pathogens, together with active R&D programs. [8]

India's farms are supported by national programs to protect livestock against such diseases. Each year, institutes like the Institute for Animal Health and Veterinary Biologicals (IAH&VB) in Bangalore, produce hundreds of millions of vaccine doses in accordance with FAO protocols which they supply to their regions at prices all farmers can afford. In addition, most vaccines are available commercially. Improving vaccine efficacy is important. Increasing productivity and herd immunity would affect economics significantly, so means are sought to improve production.

Unexplained variations in quality and quantity of vaccine production mean that, for quality to meet standards required, production programs must be monitored. Indeed, such variations are found in all cell culture processes; many scientists report privately[1]* that they can ruin otherwise simple and straightforward experiments. Were these variations understood, vaccine production could become more efficient.

How might such variations originate? What kind of hypothesis might be tested? India is currently undergoing a change of scientific heart as experiments at leading institutes document the value of traditional knowledge[9-11]. One author's detailed knowledge and experience of

[1]* The authors and their advisers have had this repeatedly confirmed in private discussions of experiments reported here with colleagues in different institutions eg Cambridge University, KSRTC Mumbai etc.

Jyotiṣa astrology, combined with experience of, and trust in, the accuracy of his predictions by the coauthors, led to the idea of testing a radical hypothesis: natural variations in cell culture processes such as those involved in vaccine production might be at least partly due to planetary influences predictable by *Jyotiṣa*. This led to investigation of possible variations in vaccine production associated with starting time – *Jyotiṣa muhurta*. A first experiment[12] analyzing Bluetongue virus infection in Baby Hamster Kidney (BHK-21) cells started under two different *muhurta* starting times yielded results, sufficiently significant ($p < 0.004$) to justify conducting a second experiment. Black quarter vaccine production started under five different '*muhurta*' start times on eight days was assessed for turbidity of solution, opacity, sporulation quality and cell mass index. 2-Factor ANOVA's found significant F values (Table 1), both for variations with times of day, and each day[13]; analysis indicated that the *Jyotiṣa grahas*[2]*, *Guru* (Jupiter), *Rāhu* (North Node of the moon's orbit), and *Chandra* (Moon) were all exerting effects consistent with predictions. These experiments were unfunded 'blue-sky experiments'. Since they monitored usual production runs they were conducted at zero cost. Private discussions of their results led to an offer to conduct similar monitoring observations at an outside vaccine production facility, effectively an independent repetition of IAH&VB's experiments. Here we report the resulting observations of Raniket virus vaccine production. Methods given below are in accordance with FAO protocols[14].

The whole series of experiments has been summarized from two perspectives: first, purely for the discovery that outcomes of processes in microbiology depend on starting time[15], and, second, for their implications for astromedicine[16], the application of astrology to medical practice.

[2] The *Jyotiṣa* term '*graha*' is often mistranslated as 'planet', but it is a more general concept, since it includes all bodies moving with respect to the fixed stars, to which astrological influences are attributed.

MATERIALS AND METHODS

Virus and Chicken Embryos

Raniket Virus strain NDV – Lasota, obtained from Indian Veterinary Research Institute , was used to infect 9 day old embryos supplied by Bobcock Breeds, Bangalore, at seven *muhurta* start times on a single day.

Muhurta Protocol

200 Bobcock embryos were infected at each start time, and subsequently divided into subgroups of 40 for HA titre analysis. A 10^{-5} dilution of seed virus with EID_{50}litre $10^{0.5}$ $_{0.1ml}$. was used for infection. Sterile Phosphate Buffer saline, containing 100 units of penicillin and 200mg streptomycin per ml, was used for dilution.

Infection Procedure

The margin of the air sac area of each egg was marked in pencil, and disinfected with 70% alcohol. 4 mm above this margin line, 0.1ml of innoculum was discharged through a drilled hole in the allantoic cavity lateral area, by means of a needle thrust down vertically.

Incubation and Screening

Using paraffin wax (melted), each egg was resealed, and incubated at 37^{o} C for a 78 hr period. All embryos were screened using candling for non-specific mortality after 24 hours, and all the dead removed. After 78 hrs incubation, eggs were chilled at 4^{o} C overnight.

Removal of Fluid for Analysis

Egg batches regained room temperature in an atmosphere that was dry and humidity controlled. Tops were again sterilized using 79% alcohol, and forceps used to remove shell portions over the air sac, and also shell membranes. For each subgroup of 40 eggs, incubated for the 78 hour time period as specified, allantoic and amniotic fluids (AAF) were removed and pooled.

Fluid Analysis: HA Titration

Volumes of pooled AAF were measured, and hemagluttination titrations carried out as follows:

1. Using a micropipette, sterile saline (50µl) was placed in each required well in round bottom microtitre plates.
2. Using a different micropipette, AAF (50µl) was titrated into the first well, which was thoroughly mixed 5 times.
3. 50µl of the first well's contents were then micropipetted into the second well, which was thoroughly mixed as before.
4. By repeating this procedure, all dilutions of virus were obtain up to 1:2048 = 2^{-11}.
5. Finally, 1% pooled chicken red blood cell (RBC) suspension (50µl) was placed in each well, and the plate gently shaken in all directions to mix thoroughly.
6. Control wells were prepared from saline and RBC suspension (50µl each), and from 100µl RBC suspension alone.
7. Incubation of well plates was for 35 to 40 mins at 25^{o} C.
8. Results were obtained by observing patterns of red blood cell realignment in each well, either directly or by using a mirror held over the top.

   (d) In control wells, RBC cells form a sharply outlined disk after settling to the bottom.

   (e) Irregular clumps of cells associated with a hollow of finely aggregated cells indicates intermediate reaction.

   (f) A uniform salmon-pink film covering a well bottom indicates complete agglutination.

   Highest dilution of virus producing complete agglutination is the Titration End Point.

RESULTS

After removal of eggs showing non-specific mortality after 24 hrs, the remaining eggs for each *muhurta* start time were divided into batches of 40 for testing, with the fifth group left deficient

by the number of subtracted eggs. Results of HA Titration after the 78 hour incubation period, cooling and overnight cold storage are given in Table 1.

TABLE 1:

HA Titre values for Raniket Virus Infection of Chick Embryos at different Start Times

A 10.00AM ***Dhanu Ḻagna***		**B 11.00AM** **Rāhukāla**		**C 11.20AM** ***Makara Ḻagna***		**D 12.05PM** **Kumbha *Ḻagna***		**E 01.00PM** **Rāhu Nakṣatra**		**F 03.00PM** **Meena *Ḻagna***		**G 04.25PM** **Meesha *Ḻagna***	
Group	x2 Titre Dilution	Group	x2 Titre Dilution	Group	x2 Titre Dilution	Group	x2 Titre Dilution	Group	x2 Titre Dilution	Group	x2 Titre Dilution	Group	x2 Titre Dilution
A1	10	B1	11	C1	10	D1	10	E1	11	F1	10	G1	9
A2	10	B2	11	C2	10	D2	10	E2	11	F2	10	G2	9
A3	10	B3	11	C3	10	D3	10	E3	11	F3	10	G3	9
A4	10	B4	11	C4	10	D4	10	E4	11	F4	10	G4	9
A5	10	B5	11	C5	10	D5	10	E5	11	F5	10	G5	9
A	**10**±0	**B**	**11**±0	**C**	**10**±0	**D**	**10**±0	**E**	**11**±0	**F**	**10**±0	**G**	**9**±0

Table 1 Caption: Five groups of 40 Bobcock Chicken Eggs containing 9 day embryos, were infected for 78 hours with Raniket virus as per standard FAO vaccine production procedures at each of seven selected times given in cols. A to G.. After being cooled to 4° C and kept overnight, pooled AAF fluids of each group of 40 eggs were tested by HA virus titre, and the number of x2 dilutions required for complete agglutination was recorded, as in the Table. The final row gives means ± standard deviations. Perfect agreement between data points in each column demonstrates test consistency; it also suggests that *production levels depend on starting time as hypothesized*. Column standard deviations (zero) obviate the possibility of the usual ANOVA being performed, and necessitate *non-parametric* statistical tests, Some would hold that such data speaks for itself and that no statistical tests are required. The double peaking (also shown in Figure 1) eliminates a simple biorhythm explanation for the observed variations in data. Consistency with *Jyotiṣa muhurta* predictions suggest that ***the observed variations are indeed due to traditionally proposed astrological influences as hypothesized***. This interpretation is supported by other reoirted experiments.

Two aspects of this data table stand out as particularly significant:

(1) The number of HA Titration dilutions in each column is the same for each batch of 40 eggs i.e. each start time produced the same HA titre measure of virus. Yields for a given *muhurta* start time are completely consistent. (A single titration on 200 eggs could not have shown this).

(2) For Groups B and E, started under two different *Rāhu* influences, 11.00 am being during the *Rāhukāla* period of the day, and 01.00 pm being when *Ḻagna* was in *Satabhisha* nakṣatra, for which *Rāhu* is the controlling *graha*, virus production measures were double that of Groups A, C, D, and F, and quadruple that of column G under a strong influence of *Guru*, see Figure 1.

Because HA tests yield integer data, and because of the precise agreement between values at each time, parametric statistical tests are not appropriate for this dataset. As R.A. Fisher himself once remarked, zero variance means data should be allowed to speak for itself, statistical tests are not needed,

Nevertheless, it is still possible to apply a statistical test to the null hypothesis, which takes the form, 'The various values in Table 1 are merely reflections of natural inaccuracies in HA titre tests; the neat arrangement with the same values in each column simply arose by chance.' The probability of this statement being true is given by applying Fisher's Permutation Test to the sets of values in the columns for Table 1 – an easily evaluated multinomial probability of 35 values (five 9's, ten 11's and twenty 10's) appearing in perfectly ordered columns (5!10!20!/35!) multiplied by the number of possible rearrangements of the columns (7!/4!2!1!). This yields a probability p value: $p = 1.07 \times 10^{-11}$. Statistics or no statistics, the data denies the null hypothesis, implying the presence of information related to the columns – i.e. to different starting times.

The same caveats on use of statistics apply to evaluating between column differences. The null hypothesis is now framed for each pair of columns, and tested by Fisher's exact test applied to the contingency table [0 5,5 0] for unequal values in the pair. The p value is given by 5!5!/10!, giving $p = (1/252) = 0.00397$. To evaluate the null hypothesis concerning the influence of the *graha*, *Guru* i.e. Jupiter, in column G, multiply independent p values for all column pairs with one column being G – six column pairs, giving $\mathbf{p} = (0.00397)^6 = 3.915 \times 10^{-15}$. To conduct a similar test for the influence of Rāhu involves ten column pairs for which one is B or E, and yields $\mathbf{p} = (0.00397)^{10} = 9.72 \times 10^{-25}$.

DISCUSSION

Three comments on the between columns p value calculations should be made: (i) arguments that Table 1 data must have resulted from chance variations can only be refuted by precise evaluation of probabilities for null hypotheses generated by suitable non-parametric tests of the data; (ii) p values have been given exactly, as there is strong resistance to accepting astrological phenomena as real, and an unwillingness to accept statistical arguments; (iii) Bon Ferroni corrections of the significance level to 0.005 make no difference to these calculations.

The degree of mutual agreement in the data must be emphasized. It indicates that production processes and measurements were *both* carried out reliably. Errors from these sources can therefore be discounted: the measurements mean what they state. Observed differences are real, and require scientific explanation at a microscopic level. What aspect of known biology might be a cause for the observed variations in viral vaccine production? A possible answer is biorhythms: diurnal variations in growth rate. The 78 hour growth period is not a whole number of days, and the extra 6 hours could conceivably result in different yields for different start times.

The data seems to deny this possibility, however. An extra mitosis would be needed to double yield. Could this occur in the 20 minutes between columns B and C? Surely not. Also, diurnal biorhythms have single peaks and troughs. Figure 1's double peak also presents biorhythm explanations with impossible difficulties. Finally, the trough to trough times of 80 minutes and 175 minutes are far more rapid than any known biorhythm variation in rates. All these aspects of Table 1 data seem to preclude a conventional biological explanation.

For the experimenters themselves, the results caused great surprise. Vaccine production has used the protocols described for many years. They are FAO standardized and there has never been any suspicion that they are not optimal, certainly not that large *systematic* differences in

output occur. The observation that output varies according to *Jyotiṣa muhurta* predictions suggests that *larger numbers of vaccine doses can be produced if starting time is optimized*.

The results demand explanation: how can such large variations in yield arise consistently in standard vaccine production processes? How could choice of starting time have an influence? That microbiological growth does not behave merely like complex sets of chemical reactions is abundantly clear from the data, as well as countless private observations by those in the field. In standard vaccination production processes like those monitored and reported here, output levels are never guaranteed, but always require monitoring. Such variations have hitherto been dismissed as experimental noise, and never explained.

In this light, this experiment offers a significant advance to the whole field of microbiology: the variations seem to be due to variable responses to environmental cues connected to the *Jyotiṣa grahas*, particularly *Rāhu* and *Guru*. Our colleagues have hypothesized that they are associated with criticality in regulation, as in 'Fractal Physiology, since this is the only recognized source of variability in biological processes. Were it possible to establish that such fractal processes can be influenced by *grahas*, our observations would be explicable.

CONCLUSIONS

Raniket virus vaccine production data presented here from standard production runs suggest that:

1. Systematic, anomalous, variations in yield and quality result from different choices of starting time. The null hypothesis that *such variations do not exist* was not upheld.
2. Furthermore, changes observed were qualitatively (i.e. direction of change) in agreement with predictions of *Jyotiṣa* astrology: *muhūrtas* when *Rāhu* was dominant resulted in increased virus production, while the *muhūrta* when *Guru* was dominant

resulted in decreased virus production, as observed in previous experiments[10] on Bluetongue virus.

3. Considerable fractions of the well-recognized, seemingly arbitrary, random variations in cell culture growth processes are due to astrological influences of various *grahas*. In the rather imprecise series of integer valued measurements reported here, 100% of the variability was explainable. What this figure may be for continuous variables like weight measurements is obviously an important question requiring careful evaluation using quantitative models for planetary influence.
4. The 'Starting Time variable' (*muhūrta*) represents a new dimension in biological experiment. It should be evaluated for various different processes in many organisms.
5. Start time offers a way to improve vaccine production efficiency at no cost.

ACKNOWLEDGEMENTS

We acknowledge discussions with H.R. Nagendra PhD, Vasanth Kumar PhD, and Alex Hankey PhD, whom we also thank for help editing. We thank Subbakrishna PhD for advice on statistics.

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FIGURES

FIGURE 1: Variations in Raniket Virus production over a 78 hour period

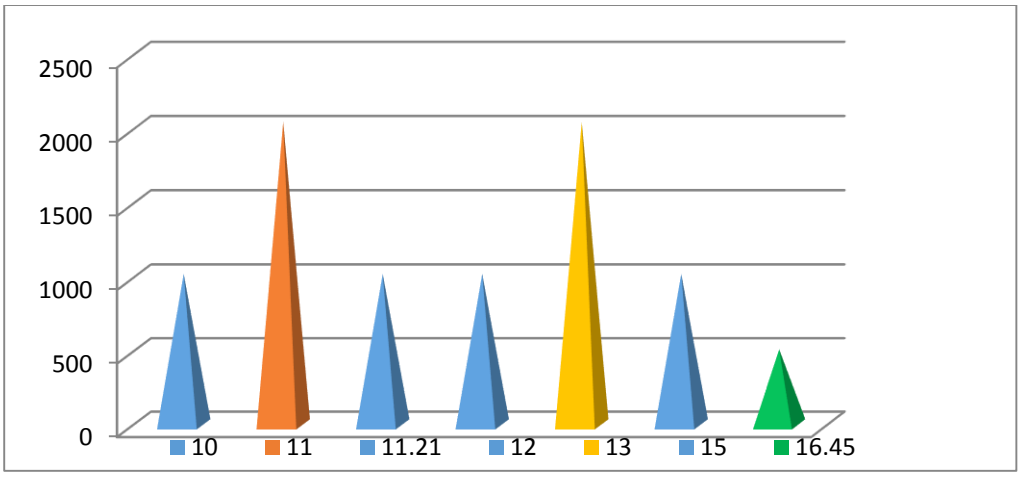

Figure 1 Caption: Figure 1 presents the output of 78 hr production cycles of Raniket virus grown in 9 day old Bobcock chicken embryos, as evaluated by standard Hemo Agglutination Titre. The two peaks of 1: 2048 (11 times two fold dilutions) were separated by a trough lasting only two hours of 1:1024 (10 times 2 fold dilutions) and bounded on each side. The statistics of the analysis yield a certainty of $p < 0.0079$ that these results are not due to chance variations in experimental noise. Such variations present a challenge to biological theory.

FIGURE 2:

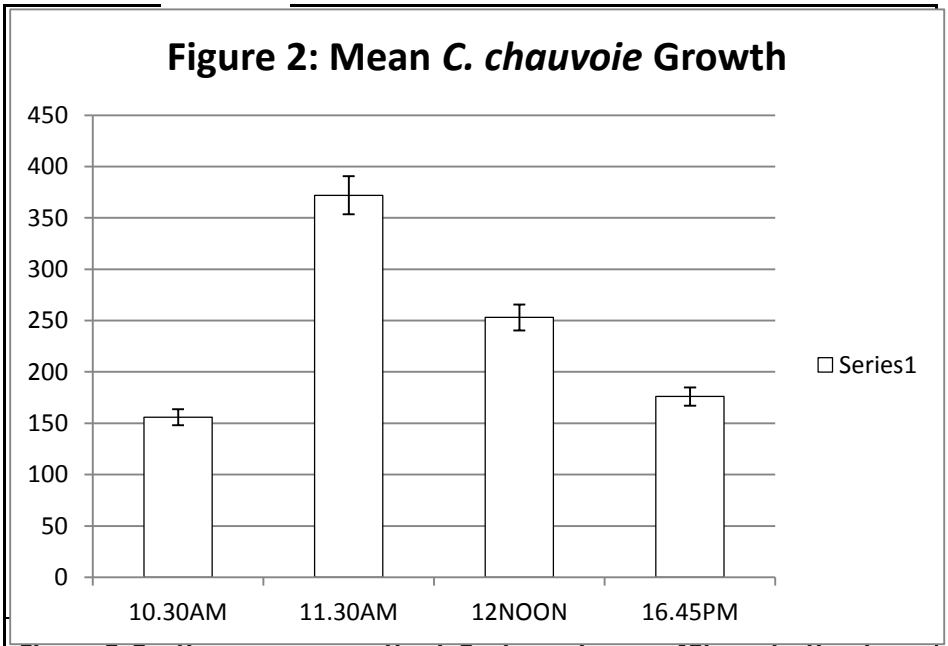

Figure 2 Caption: mean growth of *C. chauvoie* over 48hrs, starting from times stated. Significant differences in output are observed for different starting times peaking sharply just before midday.

PAPER-2

Astromedicine: A Summary of Eight Experiments

by Ramesh Rao N., C. Renukaprasad, M. Gajendragad, S.M. Byregowda

ABSTRACT

Applying principles of *Jyotiṣa* astrology to medical practice was integral to Vedic culture, and still continues today. Frawley describes astrological constraints to prescribing Ayurvedic medications and therapies; Maharṣi Āyurveda recommends *Jyotiṣa* consultation prior to treatment. Here, we summarize eight experiments, which seem to establish the validity of this little appreciated branch of traditional Āyurveda – Astromedicine. They represent the first ever experimental tests of predictions of the concept of *Jyotiṣa Muhurta* for *purely biological processes*. The results of all eight experiments were dramatic – predictions of *Jyotiṣa* were supported: ***all experiments refuted the null hypothesis, convincingly***. The experiments were of three different kinds: immune response (two), bacterial growth (two), and viral growth in culture (four), all processes known to produce highly variable results with no previously suggested reasons for observed variations. Our results suggest that *Jyotiṣa Muhurtas* may account for 50-75% of observed variance. All involve complexity biology under criticality (regulation from critical points), a key to developing a scientific theory, suggesting that all biological processes under criticality regulation may be subject to *Muhurta* related effects.

INTRODUCTION

Today, the global population, number of doctors, specialists, hospitals and medical colleges, are all increasing, but so are the kinds of disease and numbers of patients, keeping doctors and researchers constantly occupied. The need of the hour is for new systems of disease prevention and treatment. In the battle against the rising tide of chronic disease, many leading doctors and scientists are exploring possibilities derived from traditional knowledge such as Āyurveda [1-3], Yoga[4,5] and the other AYUSH systems of medicine. Astromedicine, the application of principles of *Jyotiṣa* astrology to Āyurveda [6], is one such program.

Here we present results from eight experiments on astromedicine[7-9], seven conducted under ongoing research programs to improve vaccine production and delivery at the Institute of Animal Health and Veterinary Biologicals (IAHVB), Bangalore, and an eighth carried out at a nearby vaccine production company as an independent replication[10]. All protocols strictly

adhered to FAO guidelines[11] for the processes concerned. This blue-sky and potentially controversial research was carried out at zero-cost: by starting ongoing vaccine programs at selected times, for which principles of astromedicine predict greatly differing results.

Astromedicine is the use of astrological considerations to inform medical practice[6], for example to avoid supposedly inauspicious times such as *Rāhukāla* or *Yamagaṇḍakāla* for starting medical procedures, as most surgeons in India are frequently requested. The sidereal system of *Jyotiṣa* astrology[12] holds that positions of *grahas*[13] (a wider concept than 'planets', which it also includes) at the time of initiation of any action exert an ongoing influence on the subsequent project at all times. [14] *Grahas* support or oppose it in ways governed by both their inherent properties, and initial and updated astronomical positions.

The idea that starting time can exert specific, ongoing influences means that time can no longer be considered a homogeneous variable, time and space become heterogeneous, complex variables in their influences on biological processes. In *Jyotiṣa*, predictions of starting time influences are termed *muhurta*[14]. *Jyotiṣa* makes detailed predictions of many different kinds of *muhurta* influence concerning all aspects of human life, including health and disease. These latter predictions constitute a major part of Astromedicine. The experiments summarized here used scientifically testable astromedical predictions based on the *muhurta* concept. They specifically tested predictions of the influence of starting time on well-established biomedical procedures, for a limited set of *grahas*, including *Guru* (Jupiter), *Sani* (Saturn), and *Rāhu*, the north node of the moon[15]. The experiments also found that, when strong, *Chandra* (the Moon) protects against *Rāhu*, so *Chandra* is also included.

Traditionally, the influence of the *graha*, *Guru*, is said to support life, *Sani* to cause delays or other problems, and *Rāhu* to harm life, while *Chandra* is said to protect living things against harm if powerful enough. [12-15] When astromedical predictions are considered in light of modern biology, they seem to apply best to highly regulated life processes like cell reproduction or pathogen resistance[6]. They can therefore be tested in many kinds of experiment, both *in vivo* and *in vitro*. Here we report anomalous observations on three kinds of biological process, vaccination (immune response *in vivo*), and bacterial growth and virus growth in culture, *in vitro*. All data came out in basic agreement with experimental hypotheses, the consistency suggesting wide implications for biology. Confirmation of the astromedical predictions means that such predictions may now be used to attempt optimization of biological processes in previously unthinkable ways.

All the experiments were conducted on livestock or processes concerning health of livestock. The health of India's livestock depends on government programs supplying subsidized vaccines. The State Biological Institute, IAHVB, provides animal vaccines against a broad spectrum of diseases for hundreds of millions of farm animals all over India. Maintaining quality is vital: all production runs are conducted adhering strictly to FAO protocols[11] i.e. identical conditions; all batches are treated identically. Despite this, quality and quantity of vaccine vary from batch to batch for no previously identified reason. Variations in observed parameters are sufficiently high to make ongoing monitoring essential.

In itself, this is normal. Living organisms exhibit variations in behavior, and workers in microbiology privately report high levels of anomalous variations in production from microbial growth processes. The scale of IAHVB production induced us to analyze the data for possible regularities; the potential impact of improving production levels was so great. A dependence on *start times*, i.e. time of inoculation of production vessels, came to light. For production runs over periods of whole days (48 or 120 hours), starting time dependent variations in output cannot be attributed to diurnal biorhythms. We decided to make further, more systematic, observations by planning specific starting times for some production runs. Usual monitoring observations were taken as experimental data, accepting FAO protocols as adequate for first experiments: costs were effectively kept to zero.

EXPERIMENTAL METHODS AND RESULTS

Every experiment was a blue-sky experiment conducted for its novelty dimension, seven conducted by S1 scientists and virologists at the State Biological Institute under Karnataka's Veterinary and Animal Sciences and Fisheries University, in Bangalore, the eighth at an independent vaccine production company, also in Bangalore. All followed FAO protocols specific to the procedure involved[11], and yielded statistically significant results rejecting the null hypothesis as given in Table 1.

Vaccination: the two vaccination experiments tested effects of *Jyotiṣa muhūrtas* on immune response: previously unvaccinated 7-8 month old small ruminants (sheep and goats) were vaccinated against the virulent peste des petits ruminants (PPR) under three different *muhurtas*: *Dhanu* (SaGītārius) and *Makara* (Capricorn) rising signs i.e. under the influence of Jupiter and Saturn respectively, and *Rāhukāla*.

The first experiment compared immune responses for vaccinations carried out under the two rising signs for two groups of goats (20/20), and two pairs of groups of sheep (21/20) and (13/10), totaling 104 animals. Significant differences in immune response were observed between the two conditions. Percentage decreases of c-ELISA test optical density data for 51 animals vaccinated under *Dhanu* (Jupiter) were 39.75 ± 21.44, and for 53 under *Makara* (Saturn) 18.65 ± 22.40, for which 't' = 4.904, **p** = 2 x 10^{-6}. Numbers exceeding accepted 'successful' vaccination response levels, yielded the contingency table [31,20; 16,37] for which the 1-tailed Fisher's Exact Test **p** = 0.0019. (The first results obtained in 2007 caused such surprise that experimenters insisted on repeating the experiment the following year.)

The second vaccination experiment investigated the possible influence of *Rāhukāla*. Highly significant reductions in vaccine response were observed for vaccines performed during *Rāhukāla* compared to groups vaccinated at other times on the same day: *not a single sheep of thirty-three vaccinated during Rāhukāla in three groups* (12+13+8) *of animals on three different days achieved successful vaccination*. Using the experimentally estimated fraction of uptake success of **f** = 0.4375 yields **p** = 3.25 x 10^{-12} for rejection of the null hypothesis.

Bacterial experiments: these involved production runs of pathogenic bacteria. Five were started each day in one or two 2 litre flasks. In both cases the possible influence of *Chandra*, the moon, was also tested by carefully selecting the *Nakṣatras* where the moon was placed.

In the first experiment on Blackquarter vaccine production[7] (*C. Chauvoei*), two times under Jupiter (early and late *Dhanu* rising sign), two under *Rāhu* (Rāhu in the rising sign or aspecting it), and *Rāhukāla*, were selected. The five runs were performed on each of eight days between 12.10.2011 and 28.10.2011, two days selected for their positive influence, two for negative influence, and four variable. Four measurements were performed on each of the forty production runs: cell mass index, turbidity, opacity and sporulation quality. The first question for each dataset was, has any significant statistical information been obtained? This is decided by F values from ANOVAs. With two variables, days and times of day, 2-Factor ANOVAs were performed. These found significant F values for both factors, ranging from 7.30 to 14.06 for the starting times, and 3.58 to 5.66 for the days (*Nakṣatras*). When data was normalized and combined, the 2-Factor MANOVA yielded F values of 20.43 and 65.69 respectively, accounting for 73% of overall variance of the 160 data points. Results were consistent, the *Rāhu* influence giving low, poor quality yields, except on days when the moon was under Jupiter's influence, or very strong in its 'own house' (*Kartika*). Predictions were borne out,

both qualitatively and quantitatively. Moreover, the 48 hour culture period precluded diurnal biorhythm explanations for the observed variations.

The second bacterial experiment on Haemorraghic Septicaemia (*P. Multocida*) vaccine production, found the same pattern of influences for 7 days from 01.02.2012 to 08.02.2012 at 5 times of day – strong Jupiter, weak Jupiter, and three for various influences of *Rāhu*, again including *Rāhukāla*. Two data sets were taken, cell mass index and turbidity. Results were qualitatively and quantitatively similar to those for the BQ experiments (though the influence of days was stronger for NTU). 2-Factor ANOVAS again yielded high **F** values: for the turbidity data, 22.77 for the days, and 3.0 for times of day, and for cell mass index 1.95 ($p > 0.05$) for the days and 41.36 for times of day both ANOVAs accounting for over 80% of total variance. The 2-Factor MANOVA for both data sets yielded **F** values **3.89** for the rows, and **8.69** for the columns with rem df = 59.

These two bacterial experiments yielded results that were mutually consistent: *Guru* supported the life of cells, *Rāhu* opposed it, while a strong *Chandra* both supported life and tended to neutralize the effects of *Rāhu*. This agreement suggests that the two data sets are susceptible to a single self-consistent model, in which effects of *Guru* are growth-enhancing, those of *Rāhu* are growth-opposing, and *Chandra* when strong or under the influence of *Guru* is life-protecting.

Virus Experiments: The first reported experiment[7,10] was a series of production runs of Raniket virus at the Vesper company just north-west of Bangalore on 18th November 2011. Five batches of 40 bobcock eggs were infected at each of seven different times, one under Jupiter, two under *Rāhu*, and four neutral; after 78 hours incubation, embryonic fluid samples were pooled from each batch, and assayed by HA titre. All five batches for each time required the same number of x 2 dilutions, 9 for those under Jupiter, 10 for neutrals, and 11 under *Rāhu*. The two sets of *Rāhu* batches were started at 11.00 and 13.00, with two neutral sets started at 11.20 and 12.00 between them. The null hypothesis was tested using Fisher's permutation test, yielding $\mathbf{p} = 7 \times 10^{-6}$, however this is more a test of accuracy of assessment. The probability of making the correct prediction (-, 0, +) for every batch is 3^{-35}, while the probability of the sets of five values being correctly ordered by chance is (4!2!1!/7!) giving p = (1/105) = 0.00952 The significance of this experiment is its double maximum, which seems to rule out biorhythms. Details are given in the accompanying paper. [10]

Three more viral production runs, both infections of BHK21 cells by Bluetongue virus, yielded results consistent with that on Raniket virus. The first[8] started infections by both monolayer and cocult methods, at two different times (*Rāhukāla* and neutral) on four different days (25/29 August and 2/5 September, 2011. Virus production for each start time was measured by obtaining $TCID_{50}$ values, obtained by infecting 6 x 10 plates of TC wells with successive x 10 dilutions of virus, at each start time. The internal check that monolayer cultivation produced more virus than cocult held in all cases, adding weight to the result: *Rāhukāla* starting times consistently yielded larger $TCID_{50}$ values, as predicted: Sign Test $p = 2^{-8} < 0.004$. Again, *Rāhu*'s influence enhanced viral growth: the mean increase in $TCID_{50}$ was 1.10 ± 0.276, 't' value 3.99, effect size 0.837, one sample t test $p = 0.0053$.

The second and third Bluetongue experiments[9] were carried out on the days of the solar eclipses in 2012, 20 May and 14 November, with the additional hypothesis that the eclipse would influence the biosphere globally, and so enhance viral production even in Bangalore. On 20th May, when an anular solar eclipse crossed the North Pacific, seven times were selected, four during the eclipse's passage, and three after it finished in the US South-West. An ANOVA gave figures very close to significance **F** = 2.52, p = 0.0538, a 't' test comparing $TCID_{50}$ levels from the four eclipse starting times with the three non-eclipse starting times, yielded **t** = 3.13, df=26, and **p** = 0.0043.. An additive model accounted for 41% of variance when *graha*'s $TCID_{50}$ values were set at: Eclipse +0.70, *Rāhu* +0.26, and Jupiter – 0.25.

In view of the proximity of the ANOVA **p** value to significance, we performed a similar experiment on 14th November, the day of the second 2012 solar eclipse – a total eclipse which crossed the South Pacific ocean. Three starting time slots were selected during the eclipse, and five starting time slots after it (one additional time). Statistics improved: the ANOVA yielded **F** = 3.319, df = 7/24, **p** = 0.0116, while the t test on the eclipse versus non-eclipse $TCID_{50}$ values gave **t** = 3.81, df = 30, and **p** = 0.0006; both significant.

To check on the compatibility of the two data sets, we performed 't' tests comparing $TCID_{50}$ values for non-eclipse time slots and found no significant difference (**t** = 0.81, df = 30, **p** = 0.42). However, when we compared $TCID_{50}$ values for the two eclipse time periods, we found a significant difference (t = 2.36, df = 26, p = 0.026). [9] The two eclipses seemed to exert different levels of effect! Possible explanations for this could be that the second eclipse was total, while the first was only annular (incomplete, leaving a tiny ring of light), or that the second was in *Rāhu*, which is more inauspicious than *Ketu*, the location of the first eclipse.

Finally, since the two experiments were effectively identical and data was in good mutual agreement, we analyzed combined data: an ANOVA gave **F** = 2.68, df = 14/45, **p** = 0.0062, while the t test yielded **t** = 4.49, df = 58, giving an excellent **p** < 0.00003. [9] It is pertinent that Indian tradition regards eclipses as far more inauspicious than *Rāhukāla*, a judgment supported by comparing the $TCID_{50}$ values obtained in the various experiments.

All four virus experiments rejected null hypotheses with high significance. We that starting experiments under the influence of the *grahas*, *Guru* and *Rāhu* appeared to have consistent, opposite effects: on every occasion, *Guru* definitely seemed to support the life of cells, while *Rāhu* definitely favored the viruses i.e. it opposed life – as traditional knowledge of *Jyotiṣa* astrology clearly indicates.

DISCUSSION

All eight experiments refuted their null hypotheses with **p** values far less than 0.05 – at least 0.004, most smaller still. Moreover, they were mutually consistent in their findings: in every case, the influence of the planet Jupiter at the starting time was to support the life of cells, either by increasing growth or decreasing the impact of viral attack, while that of the North Node, *Rāhu*, on start time was to oppose the life of cells, either by decreasing rates of growth, or by increasing the impact of viral attack.

The results also have significant implications for biology itself: first, they suggest that up to 80% of the variability of cell culture experiments can be explained by *Jyotiṣa* effects – the influence of *grahas* at starting time of the experiment; second, they resolve any lingering doubt about whether viruses are living entities on a par with cells: definitely not, they are the opposite; third, all cell culture experiments and technologies can now take advantage of these effects to be performed more reliably, decrease losses and increase output.

Clearly these experiments present a challenge to theoretical science. How could the positions of the planets or specific daily times possibly influence ongoing biological processes? To answer this, a two step account has been proposed based on conventional science: first, 'Edge of Chaos' states from complexity biology, inevitable in biological regulation, are shown to be sensitive to high-order quantum correlations, and second, quantum descriptions of solar system condensation are shown to result in complex sequences of high-order quantum correlations which correlate planetary positions with processes sensitive to such correlations throughout the solar system – such as regulated biological processes here on earth.

The strengths of these experiments are that: they were conducted by S1 category scientists at the vaccine production center of a state biological institute under FAO protocols, and at zero cost; different experiments gave consistent results, and both **F** and p values were highly significant. Furthermore, other senior scientists have expressed willingness to independently test *Muhurta* predictions at top laboratories in both India and abroad. The limitations are that only eight experiments have so far been conducted, and that, while they verify predictions, they only partly eliminate alternative explanations. Funding is needed to conduct experiments with higher quality protocols designed for better validation of the entire program: eg for experiments starting every 3-5 minutes, able to follow transitions between time periods.

Nevertheless, the series of experiments suggests that even allowing for biorhythms, starting time exerts a variable influence on biological processes, and may explain 50-80% of overall variance: starting time exerts a heterogeneous influence on biology. In our considered opinion, the experiment and theory in this and the accompanying paper suggest that time and space influence all biological processes. With that we offer the whole topic for discussion.

SUMMARY REQUESTING READERS' THOUGHTS AND OPINION

These experiments were informed by knowledge taken from India's ancient Vedic tradition, and conducted by S1 scientists at the state veterinary biological institute of the Government of Karnataka. FAO protocol guidelines were strictly followed. Results obtained were highly significant, seemingly beyond mere experimental noise, with excellent or outstanding **p** values on all occasions, the best being worthy of experiments in particle physics announcing the discovery of new particles. Furthermore, consistent statistical models can be constructed for observed effects. Yet, openness to novel possibilities is still required to accept the experiments into the world of science. No previous scientific tests of these kinds of possibility have been carried out. Nor are there any papers in the scientific literature – they are truly novel. Readers' comments are invited on how to accept them into the present scientific paradigm.

ACKNOWLEDGEMENTS

We are grateful for conversations with H.R. Nagendra PhD, Madan Thangavelu PhD, Amrit Ram PhD, Asha Maya PhD, Vasanth Kumar PhD, Yeshwanth PhD, K. Shivakumar MVSc, Suresh Sharma BVSc, and Alex Hankey PhD, to whom we are also grateful for helping edit the typescript. We also acknowledge Subbakrishna PhD, Ravi Kulkarni PhD, Balaram Pradhan PhD, and Judu Ilavarasu PhD, for advice and assistance with statistical analysis.

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PAPER-3

The Effect of Solar Eclipse on BT Viral Growth: an experimental study

by Ramesh Rao N, Reukaprasad C, Alex Hankey

Abstract— Complex biological processes like those involved in cell culture are subject to apparently inexplicable rate variations, generally attributed to uncontrollable microscopic fluctuations. Our State Biological Institute produces many kinds of vaccine for hundreds of millions of animals throughout India, strictly adhering to FAO guidelines, yet levels of non-biorhythm variance are often high, so production is constantly monitored. In a series of six recent experiments on two kinds of process, viral growth (4) and bacterial growth (2), we have identified a new kind of non-biorhythm variation, previously unknown to science, systematically varying with batch starting time. Cumulative statistical significance is below 10^{-22}, while the analysis of variance suggests that *it may account for up to 75% of non-biorhythm variance*. Here we report investigations of these anomalous variations on both 2012 solar eclipse days. Finally it is concluded that solar eclipses can influence starting time dependence of virus growth, and suggest that starting time effects of the eclipse result from a response of the biosphere *as a whole*, including the micro-world of cell biology. These results further validate previous conclusions that time has a heterogeneous effect on bioregulation.

Keywords- *Anomalous Variations, Biological Growth, Solar Eclipse, Starting time*

(1) INTRODUCTION

As in many countries, Indian agricultural policy is to provide farmers with subsidized vaccines. The Institute for Animal Health and Veterinary Biologicals (IAHVB) produces vaccines for all kinds of animals, both commercial and domestic, and even some human vaccines, against all kinds of infection. Bacterial and viral vaccine production and vaccination are routine, but unexplained variations require constant monitoring of production quantity and quality. Since scale of production makes it worth the effort to try to improve efficiency, we decided to see if there was any regularity in the variations. Inspection suggested a possible dependence of production level on starting time. All our production runs involve complex biological processes, subject to many still poorly understood levels of regulation or regulated influence, so even this seemingly unlikely possibility did not seem inherently impossible. IAHVB

production strictly adheres to FAO protocols (1,2), while our assays are professionally performed. These circumstances seemed sufficient to perform cost-free experiments simply by varying start times of production runs i.e. times of inoculation of production batches – an at least harmless way of seeing if something unexpected might not be present. Thus we started to conduct the investigations reported herein.

(2) SUMMARY OF EXPERIMENTS

A first, simple experiment comparing two start times for Bluetongue virus vaccine production on four different days seemed to confirm our suspicions (3) (Table 1a), so we performed another more extensive experiment on bacterial growth for Blackquarter (a bacterial disease caused by *Clostridium chauvoie*) vaccine production (4), as the process is easier to assay, and more kinds of measurement can be performed. e.g. CMI/turbidity/opacity/sporulation. Again the design was simple, start production batches at five different times on each of eight days. Results were particularly interesting since we observed significant increases in production on particular days, as well as at specific times on each day: 2-Factor ANOVAs attained significance in both factors (Table 1b).

The next experiment obtained independent confirmation of the effect. A commercial vaccine laboratory made observations of Newcastle disease virus vaccine production (4). Results of such novelty require extensive confirmation, so we continued experiments on an occasional basis. The overall statistical significance built up to 10^{-22}, a (geometric) mean of $\mathbf{p} = 3 \times 10^{-4}$ per experiment. (5) Here we present results of our two most recent experiments in detail, since they seem to have uncovered a further phenomenon, and provided a possible clue to what is going on. They came about in the following way: as experiments yielded increasingly significant statistics, the question of what might be causing the observed variations grew stronger. Some starting times definitely seemed to favor vaccine production, others to hinder it. Residing in India, we are naturally aware of traditions that speak of 'favorable' and 'unfavorable' times. One such time is during an eclipse. We decided to test production levels of a previously tested vaccine during the eclipse of 20th May, 2012, even though the penumbra never touched the Indian subcontinent at any time during the day. The eclipse's transit was from China to the South Western United States, avoiding South Asia completely. When we found a weak effect, and that statistics required improving, we decided to conduct a repeat experiment using an almost identical protocol on the day of the second 2012 solar eclipse, 14th November. Both are reported below.

Materials and Methods

Experimental System: Bluetongue virus serotype BTV-23 infection of BHK21 (Cell line 13) cells, both from IAHVB, Bangalore.

Cell Culture Media: Eagle's dehydrated medium with L-glutamine, procured from Gibco-BRL®, USA. 1X medium prepared to manufacturer's directions in Milli-Q water; pH adjusted to 7.2 using CO_2., sterilized by membrane filtration using 0.22µm filter membranes; and stored at 4˚C.

Growth medium: prepared fresh at time of sub-culturing by adding 7% foetal bovine serum from Biological Industries®, Israel.

Maintenance medium: prepared at time of infection without serum.

Microtiter Plates: 96 well (8 row x 12 column) tissue-culture plates from Nunc®.

Micropipettes: Finn Pipettes®, 200-µl and 1000-µl single channel for addition of cells, and 300-µl multichannel for addition of virus to tissue-culture plates.

Virus dilution: 100 µl virus, serially diluted x10 from 10^{-0} to 10^{-9} in maintenance medium were added to 4 wells of successive plate columns; two wells on each plate contained virus control (neat virus+media) and cell control (cells+media).

Virus titration Co-cultivation method : 100 µl BHK21 cell suspension ($3x10^5$ cells/ml) harvested from milk dilution were placed in each well, virus addition performed; plates were then covered, sealed with cellotape, and incubated at 37°C, 5% CO_2.

Assessments: wells were observed daily for CPE (characteristic cyto pathogenic effect); the number of wells showing CPE was recorded. Final readings were taken 120 hours after infection, and $TCID_{50}$ end points calculated by the standard Reed-Muench formula.

Statistical Analysis: used SPSS16.

(3) RESULTS

On 20th May, 2102, four production batches were started at each of seven well-spaced times (Table 2a). The data yielded tantalizing results. While the ANOVA only yielded **F** = 2.52, which for df = 6/21 gave **p** = 0.0538, a 't' test comparing $TCID_{50}$ levels from the four eclipse starting times with the three non-eclipse starting times, yielded **t** = 3.13, df=26, and **p** = 0.0043.

For the second experiment, we selected three starting time slots during the eclipse, and five starting time slots after it (one additional time, Table 2b). Statistics improved: the ANOVA yielded **F** = 3.319, df = 7/24, **p** = 0.0116, while the t test on the eclipse versus non-eclipse $TCID_{50}$ values gave **t** = 3.81, df = 30, and **p** = 0.0006; both statistics attained good significance. Furthermore, since the two experiments were so similar (see Methods), data can be combined. The ANOVA then yields **F** = 2.68, df = 14/45, and **p** = 0.0062, while the t test yields **t** = 4.49 with df = 58 so that **p** < 0.00003, a really excellent result.

(4) DISCUSSION AND CONCLUSONS

Taken all together, our results strongly suggest that we are looking at some real 'starting time' effect in biological processes. In particular, starting times during the occurrence of a solar eclipse have different effects on Bluetongue virus growth from starting times on the same day after the eclipse has finished. In this context, 't' tests found no significant difference between non-eclipse time slots (**t** = 0.81, df = 30, **p** = 0.42), but a significant difference between the two eclipse time periods, (t = 2.36, df = 26, p = 0.026). The two eclipses seemed to exert different levels of effect. What is going on?

Complex biological processes are subject to variation, as is well-illustrated by $TCID_{50}$ values. Rows of TC plate wells do not behave uniformly, in each row different numbers show CPE. The test incorporates variability of viral growth, the Reed-Muench $TCID_{50}$ formula expresses it. Such variations in complex biological processes have always been thought to depend on such things as chemical and temperature fluctuations, and possibly originate in genetic variation. Our experiments are new in two respects: (1) identification of batch starting time as an independent variable potentially accounting for substantial percentages of observed variance; and now (2) *identification of eclipse times as supportive to virus production*. Is time exerting a heterogeneous influence on complex biological processes? If so, accurate predictions of its effect would improve vaccine production.

What of our finding on eclipse times? Observations of eclipses have reported changes on many different levels, ionospheric (6), atmospheric (7), gravitational waves (8), meteorological (9), chemical (10), hydrological (11), and record consequent trauma to many life forms such as birds (12), fish (13), rodents (14), and primates (15). Effects on microbes have also been noted (16, 17). Most are local effects, few relate to regions far from totality. However, if their total influence affects the *biosphere as a whole*, a possible causal chain for our observations would be:

Eclipse ➔ Trauma to local fauna ➔ Global trauma to biosphere ➔ Influence on dișțant life forms

This kind of response pattern might be the beginning of an explanation for our anomalous observations.

What might cause the observed variations? Purely chemical processes will not exhibit them; we suggest that they may originate in biological complexity. What aspect of complexity biology might be involved? This question obviously requires careful consideration. In our opinion complexity may be the simplest and most promising place to start searching for mechanisms.

Finally it is concluded that the results of present experimental investigation are in excellent correlation with the concept of time &space as enunciated in the ancient Indian scientific literature the scope of this paper can further be extended by conducting various combination of the experiment with variable parameter with time &space this pioneering work is unique of its kind in the world and may represent a new dimension in microbiology. 'Starting time effects' require further investigation; one independent verification is not enough.

TABLE 1a: Comparison of Bluetongue Virus Infection ofBHK21 (Cell Line 13) Cells for Two Starting Times

TIME ⇨ DAY ⇩	Cultivation METHOD	TIME A $TCID_{50}$	TIME B $TCID_{50}$	TIME B minus TIME A
Day 1 25.08.11	**Monolayer**	**5.76**	**6.31**	**+ 0.55**
Day 1 25.08.11	**Monolayer**	**5.36**	**6.24**	**+ 0.88**
Day 2 29.08.11	**Monolayer**	**4.75**	**5.25**	**+ 0.50**
Day 2 29.08.11	**Cocultivation**	**4.63**	**4.75**	**+ 0.12**
Day 3 02.09.11	**Monolayer**	**5**	**6**	**+ 1.00**
Day 3 02.09.11	**Cocultivation**	**4**	**5**	**+ 1.00**
Day 4 06.09.11	**Monolayer**	**5.18**	**7.66**	**+ 2.48**
Day 4 06.09.11	**Cocultivation**	**5**	**7.24**	**+ 2.24**
	Mean	**4.96**	**6.06**	**1.10**
	St Deviation	**0.525**	**1.038**	**0.836**
	t Value	**Unpaired / Paired**	**2.67**	**3.72**
	p Value	**p =**	**0.0181**	**0.0074**

Table 1a presents $TCID_{50}$ values of Bluetongue virus concentration obtained in two related assays on four different days started during two different time slots, for which no difference could be theoretically expected when averaged over the precisely maintained 120 hour incubation period. Consistency of differences between Time A and Time B makes a sign test a simple means to establish that differences between the two columns are significant p = 0.00781. The consistency of observed differences between cocult and monolayer cultivation methods indicates that errors in measure result in standard deviations considerably smaller than the mean difference of 0.46. When a paired t test is performed on the differences column, we obtain t = 3.72, for which 7 degrees of freedom yields, p = 0.0074. Subjecting this dataset, with monolayer/cocult differences partialled out, to a 2-Factor ANOVA yields F=5.60 for the days, for which we obtain p = 0.0140 (df = 3/11). Variations of starting time effects with different days appear to have their own significance – for more on this, see Table 1b.

TABLE 1b: Anomalous Dependence of Overall Growth of*Clostridium Chauvoei* on Starting Times during BQ Vaccine Production(Spectrophotometric measures of Nephlometric Turbidity Units)

TIME ⇨ DATE ⇩	TIME A	TIME B	TIME C	TIME D	TIME E
12.10.11	155	420	246	179	190
13.10.11	295	300	314	434	412
17.10.11	123	380	228	146	175
18.10.11	224	370	285	180	184
21.10.11	293	422	285	176	305
22.10.11	133	400	232	224	128
26.10.11	138	327	265	163	155
28.10.11	160	332	260	165	224
MEAN	198.1	368.9	264.4	208.4	221.6
SEM	25.1	16.0	10.4	33.2	33.0

Table 1b presents Nephlometric Turbidity Unit (NTU) measurements of *Clostridium Chauvoei* after 48 hours growth in standard growth medium. The different columns, A, B, C, D, and E were started at given times on each day. The various starting times show consistent, large variations in bacteria production for vaccine, varying from 123 to 434 – a factor of 3.5. Time B tended to yield the largest production each day, while Time C tended to be second largest. Similarly starting times on 13th October, tended to be the largest in each column, and those on 21st October second largest. Not surprisingly, a 2-Factor ANOVA yields F = 12.17 for the columns (df = 4/28) i.e. starting times each day, and F = 3.58 for the rows (df = 7/28) i.e. different days, suggesting that starting time influences may vary with time of day, *and* that they may also vary in their effects quite abruptly from day to day. Corresponding null hypothesis p values are 0.0071 (days) and approximately 3 x 10^{-6} (times of day). Datasets for CMI (continuous values), opacity (ordinal, 4-10), and sporulation quality (ordinal, 1-3) were also obtained with similar ANOVA F values and P values.

TABLE 2a: Data Table from Eclipse of 20th May, 2012

TIMES ⇨ BATCH ⇩	A	B	C	D	E	F	G
1	7.5	7.23	7.5	7.66	7.78	6.45	7.34
2	6.55	6.51	7.51	7.77	6.50	6.50	6.78
3	7.23	7.50	7.34	7.78	7.34	6.34	6.34
4	7.51	7.34	7.51	7.33	6.66	7.55	6.45
Mean	7.20	7.15	7.46	7.63	7.07	6.71	6.73
StDev	0.45	0.44	0.08	0.21	0.60	0.56	0.45

Table 2a presents TCID50 values sets of 4 batches started during successive time slots on 20th May, 2012, the day of the year's first total solar eclipse. Each set ofl four batches was started within the same time slot, and their means and standard deviations are given. The question of whether different starting times result in observably different results is answered by performing an ANOVA, which yielded the p value, p = 0.0538, suggesting that, some effect might possibly be there, though more data s needed. The question of whether eclipse times (Times A, B, C and D) produced different results from non-eclipse times (Times E, F and G) is answered by performing a 't' test between the two blocks of data. The result is **t** = 3.13, which, for df = 26, yields **p** = 0.0043, seeming to suggest a probable, 'Yes'. This encouraging result led to our performing the second experiment, the data for which is given in Table 2b.

TABLE 2b: Table of $TCID_{50}$ Data from the Eclipse of 14th November, 2012

TIMES ⇨ BATCH ⇩	H	I	J	K	L	M	N	P
1	**7.66**	**7.33**	**8.77**	**6.78**	**6.50**	**6.30**	**7.23**	**7.50**
2	**7.23**	**7.50**	**7.55**	**7.50**	**6.66**	**7.23**	**7.66**	**6.44**
3	**8.77**	**7.23**	**7.78**	**6.34**	**7.23**	**6.51**	**8.33**	**6.51**
4	**7.78**	**8.33**	**7.34**	**7.54**	**7.50**	**6.66**	**6.78**	**6.78**
Mean	**7.86**	**7.60**	**7.86**	**7.04**	**6.97**	**6.68**	**7.50**	**6.81**
StDev	**0.65**	**0.50**	**0.63**	**0.58**	**0.47**	**0.40**	**0.66**	**0.48**

Table 2b presents $TCID_{50}$ values of sets of 4 batches of BT virus vaccine started during successive time slots on 14th November, the day of 2012's second total solar eclipse. Here, time slots H, I and J were during the eclipse, while the rest, K to P, were after it had finished in South America. All four batches were started within the given time slots. In this case, the ANOVA yielded **F** = 3.319 with df = 724, giving **p** = 0.0116, a reasonable indication that effects are probably present. The 't' test between the blocks of data gives **t** = 3.81, which, for df = 30, yields **p** = 0.0006, indicating that 'eclipse' and 'non-eclipse' time slots do, most probably, produce different starting time effects on BTV growth in BHK21 (Cell line 13) cells. **Added Note**: clearly, Tables 2a and 2b are of exactly the same form, and concern the same phenomenon, so it seems reasonable to repeat the 'F' and 't' tests on the combined data: **F** = 2.68, which for df = 14/45, gives **p** = 0.0062, an estimated expectation of less than one part in one-fifty that the null hypothesis is correct, while **t** = 4.49, meaning that, for 58 degrees of freedom, $\mathbf{p} < 3 \times 10^{-5}$. (In contrast, taking the p values of Tables 2a and 2b as independent yields a combined p value of $\mathbf{p} = 6 \times 43 \times 10^{-8} = 2.5 \times 10^{-6}$). We feel that even the conservative estimate of **p** makes it worth taking these rather unexpected results quite seriously. Finally, it is also of interest that a 't' test between the two sets of eclipse data, columns A-D, vs. columns H-J, yields **p** = 0.026. Might this suggestive result be associated with the first eclipse being only an annular eclipse, while the second was total?

ACKNOWLEDGEMENTS

We acknowledge conversations with H.R. Nagendra PhD, **Byregowda SM[3], Yeshvanth,** We also thank Subbakrishna PhD, for advice and assistance with statistical analysis,

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PAPER-4

Kāla and Mahākāla: Time and the timeless in the Vedic literature

by Ramesh Rao N.* Alex Hankey, H.R. Nagendra,

Time, space and causation are like a glass through which the Absolute may be conceived. There, neither time, space nor causation exist. **-- Swami Vivekananda**

Abstract

This paper explores ancient conceptions of time, as recorded in various sections of the Vedic literature, with reference to conceptions of time within Vedic astrology. The purpose is to provide perspectives for the recent scientific tests of Vedic astrology being published in accompanying papers. In this context, understanding the underlying 'currents of time' is very necessary. The distinction between the Real and unreal, the indivisible, timeless reality underlying time, and measurable time, corresponding to *Mahākāla* and *kāla* (the timeless and time), is used to define Ritual Time (Karma *kāla*), which was the original purpose of *Jyotiṣa* astrology – to help guarantee the success of ritual actions. Different conceptions of time from various sections of the Vedic literature and associated philosophies are described to show how the profound relationship between the timeless and time, first experienced in meditation, was conceptualized and understood.

Introduction: Time

Time concerns us all, humans, animals, matter, the whole universe, all are in its grip. Everything suffers from 'the bite of time'. Time is all pervading. We all live under its power: human self consciousness is inseparable from time. Man lives in time, he is aware of time, he reckons with time. Time is the matrix of all distinctions. Every human activity or experience, whether physical or psychological, social or environmental, is inexorably linked with the passage of time.

Experience of the passage of time lies deep within. In the depth of a full mind, distinction can be made between the Real and unreal. There, time, *kāla*, is experienced as neither merely objective nor purely subjective. The concept of 'real time' is not possible within a dualistic vision. *Kāla* is not manifested in terms of space, diṣṭance, course, orbit, way, or journey, (the *Adhava*'s), but through *kriya* – action, work and doing, involving specific passage of time, and time duration. This aspect of time is coloured by influences described by *Jyotiṣa* astrology as connected to the chemistry of nature.

The ancient Sanskrit language has several words denoting different aspects of the time concept, with meanings[1]:

1) Kāla – To calculate, enumerate, and also death.

2) Diṣṭa – Time assignment, appointed moments.

3) Añca – Incomparable, unattainable, unobstructed.

4) Samaya – Right time(s) for doing anything involving the study of energy and force in time-space.

The ancients regarded the entire universe as a living organism, continuously changing in its manifestation. From dawn to dusk, and from dusk to dawn, everything changes. Change is the basic law in creation. Motion was seen as a sequence of events to which times can be assigned i.e. Time was regarded as the outcome of motion, rather than motion the outcome of time. The present review aims to elucidate these ancient concepts of time, and gain a comprehensive understanding of them.

The Vedic Concept of Time

In Sanskrit, the *kāla* concept encompasses movements of everything in existence: planets and cycles of human life. In this Vedic conception, time has two aspects: the timelessness of eternity, *Mahākāla*, within which all events take place in relative time, *Kāla*[1]. The entire structure of Vedic culture is aimed at the return to *Mahākāla*'s timeless eternity from within the bonds of *Kāla* time – *mokṣa*[2].

The eternal is regarded as the unmanifest source of all the laws of nature governing every aspect of existence within time, a state of Absolute Pure Being, itself Self-Referral and self-sufficient. The unmanifest source is thus pure consciousness, devoid of any external object, conscious of Self alone. These dynamics of self-referral consciousness embody the dynamics of all the laws of Nature in their unmanifest state[3].

Mahākāla is regarded as Bhagavān – self originated, nothing generates it. It is without origin. In contrast, *kāla* is always moving on (*gatiśīla*), it can never be stopped. The name '*kāla*' signifies both time and death. *Kāla* is responsible for the life and death of each human being. *Kāla* is the destroyer of all existence, carrying all organisms towards physical destruction. Qualities attached to time are responsible for all happiness and sorrow. These concerns are the domain of *Jyotiṣa* astrology[4].

Time is personified as the God of death (*Yama*). Because death is the limiting factor in human life, *kāla* determines how long a person lives upon earth – influenced by the time of birth. So time and death are associated, as the individual's time on earth begins with birth and ends with death[5].

For the soul (ātman), however, there is no death, no time[6], because it is without beginning and without end. The Vedic concept of time is based on soul experience making the *mokṣa* transition from *kāla* to *Mahākāla* through meditation and ritual[7,8].

Ritual Time

All ritual is aimed at the eternal, *Mahākāla*, creating an essential connection between the two *kālas*. Ritual time (*karma kāla*) mediates between *kāla* and *Mahākāla*. It is impermanent because it takes place within *kāla*, temporal time. Ritual itself is an aspect of the law that transcends all laws, causes the birth and death of all corporeal beings, things and events; and upholds the cosmos by its own power[2]. Whatever is created in time (*kāla*) naturally dissolves into timelessness, *Mahākāla*. To a man in the tradition, life is lived in a constant state of ritual; there is no time other than ritual time[9]. Time, space and man as a time-space machine are ritually constructed, and carry the seeds of cosmic harmony. The ultimate goal of all ritual is to transcend relative time, antya kāla, to *Mahākāla*, ritual time, which is characterized by *Akarma* (action without generating karma), *Akrama* (no perceived order), *Akāla* (beyond time)[10].

Jyotiṣa Time-Space Classifications

Rāśis – Signs of the Zodiac

In this view, the solar system is a 'time-space machine', source and mediator of cosmic currents flowing to beings on earth, and responsible for all qualities of time-space. The sun and moon represent universal clocks, ways to measure the duration of ritual time. Moon cycles determine its *muhuruthas*. Each year contains 12 months, both solar months and lunar months, organized according to the 12 rāśis – zodiac signs (Figure 1)[11].

The ecliptic is divided into 12 equal divisions called *Rāśis* or 'Signs of the Zodiac'. The 12 signs are also known as the 'limbs of the year'. In *Jyotiṣa*, they are held to give time a form, each 'limb' endowing time with a different quality[4]. They thus constitute a heavenly body, the body of the cosmic 'time person', or *Kāla Puruṣa* (Figures 2a and 2b).

Nakṣatras

In addition to the 12 signs, *Jyotiṣa* further divides the ecliptic into 27 'Nakṣatras' (Table 1), each sign containing parts or the whole of three Nakṣatras[12]. The 27 Nakṣatras each span an angle of 13^0. 20', making up in a full circle or 'Nakṣatra wheel' (13^0. $20^{'}$ x 27 = 360^0) – see Figure 3. Each Nakṣatra is thus a region of space associated with a group of stars, the name usually referring to the brightest star in the group, and to the nondecaying current from that domain of time-space.

Table 1: The 27 Nashatras and their Lords

Lord	No.	Nakṣatra	No.	Nakṣatra	No.	Nakṣatra
Ketu	**1**	**Aswini**	**10**	**Makka**	**19**	**Moola**
Venus	**2**	**Bharini**	**11**	**Pubba**	**20**	**Poorva Ashada**
Sun	**3**	**Kritika**	**12**	**Uttara**	**21**	**Uttara Ashada**
Moon	**4**	**Rohini**	**13**	**Hasta**	**22**	**Shravan**
Mars	**5**	**Mrigasira**	**14**	**Chitta**	**23**	**Dhanista**
Rāhu	**6**	**Aridra**	**15**	**Swati**	**24**	**Shatabhisha**
Jupiter	**7**	**Punarvasu**	**16**	**Vishaka**	**25**	**Poorva Bhadra**
Saturn	**8**	**Pusya**	**17**	**Anuradha**	**26**	**Uttara Bhadra**
Mercury	**9**	**Aslesha**	**18**	**Jyeshta**	**27**	**Revathi**

The Nakṣatras are associated with the 9 grahas[13] in a set sequence,

Ketu – Venus – Sun – Moon – Mars – Rāhu – Jupiter – Saturn – Mercury

so each planet rules over 3 Nakṣatras[14]. Table 1 names the 27 Nakṣatras and their controlling planets in 3 cycles of 9, the order is the same as that of the 'dasha' time periods by which the planets govern a person's life.

The word Nakṣatra means 'one that never decays'. Nakṣatras exert a protective watch over the soul continuing over many lifetimes. In its monthly cycle, the Moon spends roughly one day in each Nakṣatra. The tradition states that the Nakṣatras are the daughters of Daksha and Kashyapa Brahma, and wives of Chandra. Rotating round the sky each lunar month, the Moon spends one night with each in succession. This expresses the idea that each Nakṣatra

possesses a different quality of energy field, which is transmitted to earth through the moon each Nakṣatra day. Each Nakṣatra is connected to ancient myths and gods. Each has its own *prakṛti* or individual nature, represented by a symbol, an animal sign, character traits, emotions, and spiritual patterns, as well as a colour, vowel sound, and names[12]. Each is made of many strands that include: *Guṇa s*, *Doṣa s*, and Aims in life .

Guṇa s

All elements of *Jyotiṣa* are associated with psychological qualities expressed in terms of '*Guṇa s*': the word '*Guṇa* ' also means 'strand', each *Guṇa* plays an important part in the life of the individual from the perspectives of Yoga[15], Āyurveda [16] and *Jyotiṣa*[17]. They are:

Sattva

Sattva is the subtle impulse ('va') of 'sat', the eternal, imperishable. Sattva is the subtle impulse of *Mahākāla* within *kāla*; by becoming *sattvic*, man becomes empowered to return to the eternal. It is the food material for dwelling in 'the real'. Having the attribute of purity, '*Sat*' also means 'being, existing, pure, true and real', '*sattva*' is where purity dwells. A sattvic person values purity of being, thought and action. An example of pure *sattva* is pure water. Vegetarianism is *sattvic*, because it rejects killing to fulfill the need to eat[15]. The power of *Sattva* works on an abstract level.

Rajas

Rajas is the quality of taking action; the searching quality possessed by all human beings. It can be equated with 'pollen of flowers', moral, emotional or mental darkness. 'Pollen of flowers' is the potential to create new flowers – just as humans activate new life; experiencing life and birth. 'Moral, emotional or mental darkness' is the inability of people to find answers within themselves, and consequently to seek fulfillment in the illusory, material world[15]. Rajas moves from the abstract to the practical.

Tamas

Tamas, the attribute of darkness, can also be translated as 'ignorance', making it plain that the darkness is mental. Mentally, tamasic people emphasize sensuality. They lack spiritual insight and knowledge, enjoying hedonist lifestyles, focusing on sensual gratification. Vedic culture suggests that tamasic people escape from their ignorance through work and service[15]. Tamas works on the practical level.

Grahas – the Planets

The *grahas* also have distinctive qualities, some being benefic, some malefic. They have distinctive spheres (space) of influence. In constructing a horoscope to guide human activity, their disposition and relative values are calculated[13].

The Pañcāṅgas

Ritual time and *Jyotiṣa* astrology time go hand in hand. Neglecting the former, *Jyotiṣa* time is purely *kāla*, relative time, but in the context of ritual, it is transformed by ritual time into *Mahākāla*, Absolute Time – beyond time. There are five kinds of *Jyotiṣa* time division – *Pañcāṅgas* – which serve a twofold purpose in ritual time: they schedule religious ceremonies, and they record cosmic events taking into account lunar, solar and stellar situations. These 'five limbs' are: *Tithi* (day in lunar cycle), *Vara* (solar day), *Nakṣatra* (lunar position), *Yoga* (quality of time by sun-moon relationship) and *Karana* (half-lunar day). The *Pañcāṅgas* ascribe strengths and qualities to divisions of time[10].

Ritual time-space is specially created for the desired consciousness[9]. Like time, space is of varying quality, diverse and discontinuous. Not all places are suitable for sacred activities, some are more effective than others. A location's effectiveness depends on *vāstu*, associations with Gods, sages, and pitris (ancestral spirits). It can be improved by the power of mantras.

Within sacred space, purity space (supreme *sattva*) and protection space (*kavaca*) are important components[9].

Ritual time is measured by uttering an appropriate number of mantras, counting beads, reading scripture, using ritual instruments. By increasing the number of performers, ritual time can be accelerated with each successive performance. When a ritual is performed, its ritual time and ritual space are inextricably bound together. The impact of, or merit accrued from a ritual action can be increased many times by performing it at an auspicious time, e.g. bathing in a river. Similarly, directions faced by performers of rituals at various times are prescribed. Each ritual has component actions (*karma*) which must be performed in a prescribed order (*krama*), at appropriate times (ritual *kāla*). These make up the *Mahakarma* – great act – within the *Mahākāla* of the ritual. They can best be understood by analogy with the three concepts of body–mind–spirit, which together participate as a single entity. Ultimately, as ritual is rooted in the transcendent, the ultimate goal of ritual is to transcend the temporal into *Mahākāla*, the eternal[9].

Time in *Jyotiṣa* Astrology

Jyotiṣa regards the whole existence as a singular unit spread over the canvas of **space** and **time** past, present and future. All appearance is manifested from the invisible 'seed force level' to the gross level of the matter world with its own cosmic order. Every individual moves under the influence of 'guiding laws of nature'. These are transmitted in consonance with the overall structure of natural law, from heavenly mansions revolving round the individual and celestial bodies in orbits round the sun (or earth), and felt as tendencies down below by human beings in their abode on earth.

Astrology is thus a **time-space science** offering systematic explanations for differences in personality, talents, peculiarities, temperament, likes and dislikes, opportunities and

experiences, in short, how the worlds of man and cosmos are coordinated: how the workings of the solar world, situated millions of miles above us, direct variations in body and mind *Prakṛti* s, and are thus the key to understanding our life on earth; and how, when man acknowledges the cosmic source of his feelings and thoughts, the two worlds are brought into harmony and collaboration, so that man can return to his source and *kāla* be transmuted into *Mahākāla*.

The cosmic world is the ultimate source of all the various factors influencing our lives. From the sky, and space, we receive varying qualities of light, air, heat and rain. These factors influence the production of foodstuffs like fruits, vegetables and herbs that are essential to human life. Plants receive the seed energy from space and transmit it to the bodies of those that consume them, just as mantras transmit the seed energy of spirit into the mind. Both augment the prāṇa , one from without, the other from within.

In *Jyotiṣa* – literally, the 'Lord' or 'science' of light – the medium of light is the measuring tool of time, and the movements of all things. Planetary movements are closely correlated with changes in bodily organs and functiions. Phases of sun and moon, and corresponding flows of their energies, all relate to health. The sun relates to awareness while the moon relates to the mind, creating changes in emotion and mental faculties. The moon in turn conveys qualities analogous to colors from its location to all beings on earth. Each planet is similarly connected to physiology in terms of colors.[18]

Cycles of Cosmic Time

Cosmic time is perceived as cyclical, a never ending cyclical process, which is both repetitive and exhaustive. Each time cycle has three components: Sṛṣṭi – creation, Stithi – continuation and Laya – dissolution. Each cycle begins with creation, continues for a certain duration, and then dissolves into nothingness; repeating after a brief respite. The same divisions are found in

a day: each day consists of dawn, daytime and dusk, finally dissolving into the darkness of night; similarly for individual life, consisting of childhood-adulthood-old age.

The Vedic calculation of time comes from the sage Ganita who is mentioned in the Manusmriti and Mahabharat. He calculated the duration of each cycle in human years. He divided cosmic time into kalpas which is a day and night in the time and space of Brahma, the creator. Each kalpa is said to equal to 8.64 billion years (Chaturvedi, 2006). One kalpa consists of two arthakalps (4.32 billion years of each), which are a day and night of Brahma. Each arthakalpa is divided into 1000 mahāyuga's. Each Mahāyuga is divided into four yuga's namely Kritiyuga, Tretayuga, Dvāparayuga and Kaliyuga. At a lower level, a Divine day equals one year upon earth, and is divided into two equal periods of approximately 180 days: uttarayana, the period of increasing sun (or 'day') and dakshinayana, of decreasing sun (or 'night') (see Table 2). During Uttarayana, the Sun leads, and dominant rasas are Tikta (bitter), Kashaya (astringent) and Katu (Pungent), and the strength of organisms increases (Grīṣma -Shashira-Vasantha ritu); during Dakshinayana the Moon leads, and dominant rasas are amla (sour), lavana (salt) and madhura (sweet) all of which decrease growth of organisms (Varsha-Sharath-Hemanth ritu).

Vedic philosophy regards quantified time as an aspect of creation. We experience it only as long as we are bound to the things of this world through our senses[7]. Time is a mental construct, created in every instant by our senses, and subjective perception. It is a part of the illusion which we take as real. In God's sphere – consciousness – there are no divisions of time. There is only the present moment, one continuous, indivisible and indistinguishable state of existence – the 'eternal present'.

TABLE 2: Cosmic Time

NAME OF DIVISION	DURATION IN YEARS	REMARKS
Kalpa	**8.64 billion years**	**A day of Brahma**
Arthakalpa	**4.32 billion years**	**A day or a night of Brahma**
Mahāyuga	**4.32 million years**	**1 Mahāyuga =4 Yugas**
Satyuga	**1.728 million years**	
Tretayuga	**1.296 million years**	
Dvāparayuga	**864 thousand years**	
Kaliyuga	**432 thousand years**	
Manvantara	**308 million years**	
1 year of Brahma	**3.1104×10^{15} years**	**Equals 360 Kalpa's**
1 Mahakalpa	**3.1104×10^{17} years**	**100 years of Brahma's time-space**

Time in the Vedic literature

Yoga-Vāsiṣṭha

Kāka Bhuṣuṇḍa who remained immortal, even though time encompasses birth and death was questioned by Śrī Rāma. In answer to the question, Bhushunda narrates the secret of his long life. "Death does not come nor does the thread of time work in one

1. whose heart does not carry any desire or anger,

2. whose mind is not fickle, and reposes in the most holy abode,

3. whose contemplation of Self is excellent – since this destroys all sorrows,

4. who has awareness of prāṇa – when practiced steadily, ageing time does not apply i.e. absolute Being is felt.

By eliminating mind content, and steady practice of prāṇa yama, consciousness attains the Absolute, timeless state. For that, mind should become stainless Self – the cause of long life. Then the bite of time fails.[19]

Bhagavad Gītā

As the unfailing recorder of appearance-stay-disappearance of things, time is identified as Ishwara. Divisions of time have their beginning and end, but time itself is without beginning. Endlessly flowing and equated with God Supreme it is called *Mahākāla*. All existence is in time, but ritual time rooted in nonexistence is different. The ultimate goal of all ritual is to transcend temporal time (Anitya kāla) into ritual time. *Mahākāla* is characterized by Akarma (no action), Akrama (no order) and Akāla (no time). There are three varieties of Kāla are: Kāla in the sense of running time e.g.(Ageing Processes); Kāla in prakṛti (Āyurveda); Kāla as the eternal embodiment of knowledge and bliss.[20]

The lord himself is embodied as time: "I am the mighty world destroyer", is one of the numerous expressions of Vāsudeva . All events in nature get buried in time which itself contains all events & all causation.[21] In this existence there are two phases, relative and absolute. The manifest phenomenal world is relative compared to absolute existence, eternal, unmanifest and imperishable. Those who attain it will not return: this is my supreme abode state, the immortal state beyond time. Vāsudeva is maha-ātman – none is greater than Him. He is Anantha because he transcends time, space and causation.[22]

Time knowledge is a sovereign science, containing sovereign secrets; it is supreme, holy, most excellent, directly enjoyable, imperishable, an unmanifest divinity, and ananta (endless).

Vaishnaivism

No substance exists other than the Lord, neither the elements, nor karma, nor time, nor prakṛti , nor jiva*. All are His Māyā , assuming form under triguṇa . For the purpose of creation, preservation and destruction through the agency of the 5 senses, and their corresponding objects Lord Vāsudeva presides over the senses. The guṇa s bind individual souls with

consciousness in the body–mind, all in one. Time is the Lord's māyā disturbing guṇa equilibrium, transforming them. From mahat (cosmic intelligence), time-space emerges.[23]

Upaniṣads

The Upaniṣads propose the concept of māyā . Only the Absolute is real. With reference to that, divisible time, in which change occurs, is 'unreal'. The whole concept of change is due to a misconception, an illusion, because the Real, the Absolute, is not in time. Rather the Seer is being absorbed into the Whole – *Mahākāla.*[24]

Om stands for Brahman as both cause and effect. Om is the phenomenal world, past, present and future. If anything exists beyond this that too is Omkāra , Brahman itself. Omkāra encompasses the entire concept of time, past, present and future and Trikālātītam. Time past-present-future are relative terms; Trikālātītam refers to Absolute time. When we relate to particular times and places, we are speaking of the individual, but Brahman is not specific to any Time or place, he is beyond Time and Space – like *Omkāra* .[25]

Time is supreme and Time Science is a science of the highest importence.[26]

Time is the creator of everything.[27]

The Sun moon and stars do not shine in presence of Brahman. Implication: they have no light of their own, but derive their light from Brahman. All things are under the shelter of Brahman. Nothing exists independent of it, nothing can surpass it. The state of Brahman is timeless and Absolute.[28]

Nyaya and Vaisheshika

Nyaya/Vaisheshika (NV) deals mainly physics, chemistry and other material sciences including reasoning or logic, metaphysical studies i.e. search for knowledge of God. It is partly science and partly philosophy, dealing with nine elementary concepts - Earth, Water, Fire, Air, Aakasha, Time, Direction in space, Mind and Ātman.

Definition: – time is inferred from the relation between past (*Bhūtakāla*)

and future (*Bhaviṣyat Kāla*), discounting that of place. It is marked by association of an event with the sun's revolution and is measured by *kshana*, *dina*, *rtu* (seasons), *ayana*, *saṁvatsara* etc. *Kāla* is an entity to be considered when dealing with chemical and physical changes.

NV refers to Soul, Ether, Time and Space as VIBHO – infinite and indivisible. It offers explanations by example: the ripening of a mango. A mango stored in hay, fruits are their own color and taste good, and color develops on it. If a mango is exposed to hot sun – the fruit ripens quickly, but its qualities are different. A mango exposed to hot air ripens quickest, but lacks good taste.In all three conditions, time is the main factor effecting biochemical changes and has relatively more importance.[29]

Sāṅkhya and Yoga

Time is an elemental mental construct (*buddhinirmāṇa),* a structure of the mind. Space and time do not exist separately, but are 'interpenetrating'. Space is not like a box, in which all things exist, but is continuous with all objects. All matter has evolved out of space and time. It makes its first physical manifestation as a mode of space. Time is regarded as the Original Dynamic, existing prior to space and determining its evolution or emergence. Time exists in all products of space in the material / biological worlds.[30]

Visishtha Advaita

Vishishta Advaita accepts time as a real entity, an eternal flow without beginning or end, inseparably associated with everything in the universe. Time is an inseparable attribute of *paramātman*, it is of two kinds, indivisible or divisible. Indivisible time is similar to absolute time; divisible time is the mind's projection – the cause of experience of past-present-future. Acceptance of such reality depends on *Pramāna*, valid knowledge, based on perception-inference-verbal testimony. Time is the instrument of God creating experiences in his field of play. In his own eternal sphere, time plays no role as it does here, God himself has no need of

time. Time is an accessory cause of transformation of primordial matter and its evolutes – the material cause of its own transformation eg *nimisa, kasta, kāla,* etc.[31]

Ṣaḍ Darśana

When a past event occurred, time was in the present. Time, when it is occurring, is always present, and when events will occur, Time is future. The apparently threefold character of time, past – present – future, is one eternal flow without a break, an indivisible unbroken continuity.[32] Experience of time enables the mind to relate what has happened, what is yet to happen and thus to divide time into past, present and future, but Time's true character is the eternal present. In reality past and future are also present.[32] Space and time exist with reference to subjective being, the consciousness principle. When consciousness manifests, time assumes spatio-temporal forms, and subjective being becomes mental – *Manomāyā* . Space and time are twin terms of conscious creative intelligence. In speech alone one separates substance from its source, never in fact, never in experience. When self-consciousness becomes manifest, it becomes subject to existence embedded in space-time. The supreme truth is that, without Me there is no space or time, yet My ultimate being has become all space-time: I am everywhere, in all time.[32]

Discussion

The *Mahākāla* concept, central to Vedic conceptions of time, sets the entire structure of life and living in a different context from that of western science, or indeed almost anything in western thought. As the above examples show, it, or a related experience, is an essential feature of the major systems of thought in India. The reason probably boils down to this: whatever their intellectual persuasion, almost all originators of systems of philosophy in India were trained to experience the mind's silent depths. One of the easiest aspects of those states to experience is the 'sense of the eternal'. For this, steadiness of mind is required but is not the sole cause; the falling away of trivial concerns, and the expansion of awareness to wider

perspectives and larger realms seems to open the door to feelings of eternity, as regular practitioners of appropriate techniques will attest.

The above analysis of the conception of time in the Vedic sciences has been conducted following a series of scientific experiments testing various *Jyotiṣa* hypotheses which yielded remarkable results.[33,34] Taken as a whole, the experiments provide consistent empirical evidence for the metaphysical effects predicted by *Jyotiṣa*. *Jyotiṣa* is often considered a 'Time Science', and the metaphysical forces with which it deals act directly on the Jiva or soul. In order to understand the scientific implications of these experiments more deeply, it is necessary to consider both the nature of time, and the nature of the soul as a 'time-space vehicle'. In the foregoing, we focused on the former, the nature of time, as understood in the Vedic sciences, in order to see how it differs from the conception of time in modern western science.

Predictions made by *Jyotiṣa* can be applied to all life forms. They do not distinguish one animal from another. Furthermore, since its medical predictions apply to individual organs, and to tissues in those organs, it is clear that, if it is valid, *Jyotiṣa* influences operate at least down to the single cell level. Our experiments tested *Jyotiṣa* predictions in viral propagation in chick embryos[33], growth of the anaerobic bacterium, *Cl. Chauvoei*[34], and virus propagation in baby hamster kidney (BHK21) cells.[35] In all cases, growth of cells or their resistance to pathology was tested at times considered variously auspicious and inauspicious for life, i.e. for the organism concerned. Consistent statistically significant results were obtained throughout, combining to yield very highly significant p values.[36]

The results suggest that the metaphysical forces treated by *Jyotiṣa* are at work on all biological organisms at all times.[37] While this first series of experiments has not been extensive enough to define the nature of all such forces, they are sufficient to reject the position of scientific skepticism that no such influences exist, and to do so with a good degree of confidence. Previous experiments, conducted purely on planetary transits at birth, have

strongly suggested that the position of scientific skepticism is not valid[38]; our experiments also point to this being the case.[33-36]

Conversely, the experiments suggest that a fair degree of confidence can be placed in the existence of metaphysical influences spoken of by *Jyotiṣa*, both those encoded in planetary positions[33,34], and more general ones like *Rāhukāla*.[33-36] They can apparently produce powerful effects in the lives of anyone anywhere, indeed in any living organism. [37]

Jyotiṣa differs from western astrology in that it is set in the overarching context of the Vedic sciences, those portions of Indian traditional knowledge pertaining to Vedic culture. The entire structure of Vedic culture was designed by its leaders, the *Maharṣis*, to aim at spiritual liberation and immortality. All its 64 arts are designed to progress their students on the path to *Mokṣa*; their Masters were were not true Masters unless they were established in enlightenment.

The structure of *Jyotiṣa* is centred on the sequence *Dharma – Artha – Kāma – Mokṣa*, the four types of 12 Houses viz: 1,5,9 (*dharma*), then 2,6,10 (*artha*), going to 3,7,11 (*kāma*) and 4,8,12 (*mokṣa*). The sequence indicates that natural law (*Dharma*) is structured to bring the soul experience ranging from the physical, material to the metaphysical-spiritual; a journey from matter to non-matter. By gaining fulfillment (*Artha, Kāma*) in this world, the soul can then gain liberation (*Mokṣa*) from it, and find higher fulfillment in the next. *Jyotiṣa* is thus concerned with the patterns of natural law that can promote progress on the path to mokṣa, increasing happiness, influence and power at each step. *Jyotiṣa* is specifically concerned with foreseeing influences that may create opposite effects before they arise, and providing knowledge of how to avoid such influences, so as to eliminate obstacles on the path and make progress speedier. Its concern with growth to mokṣa makes *Jyotiṣa* a supreme science.

From the perspective of *Jyotiṣa*, the key to progress on the path to *Mokṣa* is energizing the subtle body (*Sukshma Sharira*) with the correct planetary vibrations in accordance with a

person's *Jyotiṣa* constitution found from the *Janma Kundali*. This makes it possible to avoid malefic effects in life, and for the *Jiva* to gain the protection of the *Kālapuruṣa* , and rise to the level of the divine, established beyond space-time in *Mahākāla*. For this reason, the *Kālapuruṣa* is often equated with the body of Lord Vishnu, the *Viśvasvarūpa* , depicted in Figure 2b. In fact, all souls are under the command of the supreme *puruṣa* , *puruṣottama* , something all come to recognize as they rise to that level of consciousness.

The specific concern of *Jyotiṣa* is thus with the influence of subtle, planetary vibrations on the subtle body of the organism – human or otherwise. Certain vibrations will strengthen an individual, while others may weaken them. All organisms are subject to such influences, but humans are more easily able to go beyond them by attaining *Mokṣa*.

Understanding *Jyotiṣa* thus requires the ability to relate to and understand the metaphysical. Those progressing on the spiritual path, and growing in the experience of the subtle, slowly gain the ability to do so.

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PAPER 5

A New Kind of Biologically Active Orientation-Sensitive Field Coupling to Complexity Based Biological Regulatory Systems?

by Rameshrao N. and Alex Hankey

Introduction

Very occasionally one is privileged to read a scientific idea of such breath-taking depth and originality that it has application to explain areas of experience not previously accessible to science. Such is the idea presented in the first article in this issue, "The Cavity Structure Effect in Medicine: The Physical Aspect", by L.B. Boldyreva (1), who briefly summarizes a number of mathematical investigations into anomalous vacuum states of superfluid quantum systems, and shows that they have applications to understanding orientation and shape effects observed by certain 19th and 20th century physicians who placed patients in 'cavities' with particular shapes and orientations in order to cure specific diseases.

In today's world, science has reached a certain measure of richness and complexity, and many scientists are proud to think that science is now essentially complete: all fundamental scientific discoveries must have already been made, and little or nothing remains to be done at fundamental levels. The only valid scientific endeavours according to such scientists are to dot the odd 'i' and cross the odd 't' that has not already been attended to. The problem for such scientists is that their views, though shared by many, are purely doctrinal; there is no evidence that their beliefs are valid. The opposite rather holds: there are large numbers of phenomena, which have been well recorded by humans in many different cultures, and for which there are not only no scientific explanations, there are no conceivable explanations at the current level of development of scientific theory. Rupert Sheldrake is a towering example of a scientist who has written extensively about such phenomena in e.g. 'The Sense of Being Stared At' (2), and shown how science that fails to acknowledge such phenomena suffers from severe lacunae (3). Another example of such a phenomenon is Homeopathy, discussed in the final, review article in this issue. (4)

Forschende Komplementärmedizin is fortunate that its editorial board is not oriented in this direction, and its members are comfortable publishing papers about phenomena for which there

is, as yet, no scientific theory (5). Human powers of observation are thousands of years old,while modern science as we know it only dates from Galileo, Descartes and Newton, and their discoveries of kinematics and mechanics, coordinate algebra, and calculus, respectively, some 400 years ago. Compared to the body of recorded human experience, modern science is in infancy, and its much vaunted successes need to be counterbalanced by acknowledgements of its still severe limitations. Indeed, in the field of medicine, doctors have relatively low life expectancy: is this not evidence that they do not understand how to achieve health – andthat doing so may involve factors currently beyond science and the scientific imagination? Recent articles suggest that vitamin supplements taken to promote health in the short term, increase the occurrence of cancer, and may even shorten life in the long-term. (6)

Cavity Structure Effect and Related Subtle Phenomena

Phenomena like 'the Cavity Structure Effect' (1) therefore merit investigation, especially as they exist in different forms in different cultures. In India, where I work, there is a tradition of architecture known as '*Vastu Vidya*' – knowledgeof '*vastu*', or the placement and location of buildings such as domestic housing and temples (7). It is closely allied to the study of Indian astrology or *Jyotiṣa* (8), because the terms of reference used to describe the two systems are the same. Like all the ancient sciences, *Vastu Vidya* and *Jyotiṣa* work on the principle that the manifest world of sensory experience is built up in layers, and that underlying the gross realm of sensory experience, there are levels of subtle experience that only become available when awareness is refined and sensitivity has developed on levels that are *sukshma* or subtle. Indeed, the ability to interact on subtle sensory levels is one of the main purposes of traditional practices taught by the ancient Vedic Ṛśis to their children, described in such stories as those about Brighu and Svetaketu in the Taittiriya and Chandogya Upaniṣads (9,10).

The central idea in all Indian sciences is that each subtle level controls the level above it. Learning to operate on subtle levels of nature is therefore the key to gaining control of different aspects of life. This can even be seen in western life, since the Vedic sciences regard the intellect as more subtle than, and controlling the content of the mind. Those with more highly functioning intellects therefore tend to find themselves acknowledged as sources of inspiration, knowledge and expertise for those needing guidance in various fields. In the case of human life itself, the Vedic Sciences name various 'subtle bodies' that control the *annamayokosha*, or gross physical body acknowledged by modern bioscience: the *prāṇa mayokosha* (or body of vital energy), the *manomayokosha* (or body of mind including feelings and emotions),the

vijnanamayokosha, or body of higher intellect with knowledge of the subtle realms, and the *anandamayokosha* or body of deep spiritual experience and understanding (9).

The Vedic Sciences thus extend themselves self-consistently into fields that are currently beyond the limits of modern science, providing detailed accounts of how to access and understand them. If western science is to catch up the Vedic Sciences, it must first gain the humility to acknowledge its present limitations, and learn to do experiments in fields for which it presently has no theory (5, 11). The observations quoted by Boldyreva (1), and the theory she develops, are examples of this kind of revolutionary science at work. What she states is that, when the vacuum state of a system possesses superfluid kind of properties, it gains measurable properties that differ according to orientation with respect to other physical fields such as gravitational, electric and magnetic fields. Remarkably, this is exactly the kind of property that the Vedic sciences *Jyotiṣa* and *Vastu* ascribe to physical and biological structures.

Experimental Tests of *Jyotiṣa*

Recently, *Jyotiṣa* has successfullystood up to a number of tests of its predictions for microbiological processes (12).It is now time to develop new classes of theory that can help accommodate such new experimental phenomena into the overall realm of science, where a consistent underlying theoretical base forms the foundation. Boldyreva's work contains just such possibilities, and is therefore of value in a far wider context.

The tests of *Jyotiṣa* predictions are worth recounting, as the theory developed to explain them may possibly be generalized to a form akin to that proposed by Boldyreva. Rameshrao Narayan and colleagues at the Karnataka Veterinary and Animal and Fisheries Sciences University, have conducted a series of pilot experiments, consisting of observations of regular vaccination production runs for bacterial and viral vaccines started at different times(12-14). Choosing starting times traditionally considered maximally auspicious for living organisms was found to significantly enhance bacterial growth and quality,while inauspicious starting times decreased them. For virus propagation in cellular hosts, the opposite was observed: times considered auspicious for life decreased virus vaccine production, while times inauspicious for life enhanced virus vaccine production. Of the observed variance in microbial growth, Rameshrao was able to attribute between 70 and 80% to factors associated with starting time.

The implications of these experiments are truly revolutionary: not only do they imply that many if not most microbial growth processes are subject to influences identified by the Vedic science of *Jyotiṣa*, they clearly distinguish between cells and viruses, identifying the latter as distinct

from living organisms. Current theory proposes that variations in microbiological growthare due to purely random variations in rates of chemical reactions involving "small numbers of big molecules" (15). The experiments suggest this 'stochasticity hypothesis' is inadequate – stochasticityas the *sole* cause of variation is denied by each and every experiment to date. (8)

A theory has been developed to explain these observations (16). It combines unusual aspects of astrophysics and biophysics First the astrophysics: during solar system condensation, collisions betweendust particles, gas molecules etc. generate ultra-high order quantum correlations, which become organized by system angular momentum, and eventually become focused in each planet. Second, the biophysics: in complexity biology, preferred loci of regulatory control maximize sensitivity of response, a condition implying that they are located at feedback instabilities; physical instabilities, however, contain high levels of internal quantum correlations, and are therefore susceptible to influence from any system with which they are correlated. This means that biological regulatory systems can be influenced by external sources of high-order quantum correlations, like those the astrophysics predicts to exist in the planets. Conclusion:ultra-high order quantum correlations found in the planets can provide subtle input into biological regulatory systems andcontrol the way they behave.

Relationship to Cavity Structure Effects

But what are the mathematical properties of the physical systems now believed to lie at the heart of biological regulation? Being unstable, they are associated with non-simple harmonic potentials: the usual, 'quantizable', structure of energy levels is absent. Their effective potentials must obey power laws greater than two, so that their energy levels become infinitesimally closely spaced close to the vacuum state. It is quite possible that, for multi-critical systems known to exist in higher organisms (17), these new, complexity-based models of organism regulation effectively contain *degenerate* vacuum states like superfluids, in which case, Boldyreva's models may become applicable.

Jyotiṣa proposes that organisms themselves can take on different, 'planetary' qualities (8), while *Vastu Vidya* (7) suggests that such 'planetary vibrations' surround organisms and physical objects in specific patterns. These currently unexplainable properties seem remarkably close to the new field effects proposed by Boldyreva. (1) Her results may have the potential to explain far more than medical properties of cavity structures – effects of housing, noted in *Vastu Vidya* and *FengShui*, and how those incorporate planetary vibrations; houses are only larger kinds of cavity structure after all. Might we not hypothesize that all involve the same complexity

properties of organism regulation used to explain influences of planetary positions on biological processes?

Three Examples

To illustrate how Indian traditional knowledge may provide examples of Boldyreva's statement that it is possible for fields generated by a superfluid vacuum to generate different qualities along differently angled surfaces, consider (1) the way Vastu Vidya arranges fields with different 'planetary' vibrations around a rectangular building, (2) how different planetary fields are said to surround the planet earth in Vedic astrology, *Jyotiṣa*, and (3) certain kinds of specific predictions for people.

First consider Figure 1, which assigns one of the nine grahas to each of the eight main directional sectors of a rectangular building - most precisely when its axes are aligned with the true North and East. North-East (top left) is said to be 'Governed by Jupiter and Ketu'; it is the only direction to have two grahas and is considered the most spiritual, and most auspicious for spiritual liberation since Ketu is 'Mokṣa Karaka' - the indicator for that goal. East is the Sun; South-East, Venus; South, Mars; South-West, Rāhu, the most inauspicious; West is Saturn, the next most inauspicious; the North West, Moon; and North, Mercury. This means that, in each direction given, the vibrational quality of the specified planet will be dominant. We may imagine, that, in different directions relative to a house (a kind of cavity), the superfluid vacuum field assumes different vibratory qualities, and that in each of the eight directions, those corresponding most closely to the vibratory qualities of the planet specified in Figure 1 are activated. This sequence of ideas is of the kind for which a deductive theory could be established. Hopefully one would only need to specify which superfluid vacuum field of a number of possible kinds was in operation. If readers remind themselves of the case of molecular orbital fields surrounding an atom, they will see how they dominate different directions differently e.g. an ultra simple example is the tetragonal set of sp^3 bonding orbitals in carbon. Vastu specifies *Jyotiṣa* fields surrounding a building that present suspicious similarities to such kinds of directional wave functions - which is precisely where Boldyreva is starting from with her superfluid vacuum states. So in this proposed further level of detail her theory seems to fit its proposed application.

Now, see how to apply this principle to one's own life: if the vibration of a planet is beneficial to a person as specified in their birth chart - then being in the sector of a house where that planet dominates will benefit them. Equally, if, according to their birth chart, a planet is inimical to

a person, then staying / sleeping in a room in the corresponding position in a house, as given in Figure 1, may cause harm of the kind specified in their chart. Families with kitchens in the South West corner may tend to eat left-overs and stale, toxic food. If the dining room is there, they may get into arguments at the dinner table.

In this regard the entrance to a house is also very important, since the vibrations of the planet dominating the direction of the entrance tend to pervade the whole house. In my own case, the entrance to the building where I stay is in the middle of the North side (Mercury); the room itself is in the North West corner of the building (Moon); and the entrance to the room I use is in its North East corner (Jupiter / Ketu). These three vibrational influences are activated: Mercury from the building entrance; the Moon, from my room's position in the building; and Jupiter / Ketu from the entrance I use. Should I want more effect from the Moon, and less from Jupiter, I only have to stop using the door in the North East corner, and start using the door that I currently keep closed in the North West corner. In my case, the Moon is both Atma Karaka - indicator for the supreme spirit within - *and* the planet guiding my career. She is highly auspicious, while Jupiter is less so (for those whose natal charts have my ascendant). In Vedic sciences, such principles are easy to memorize and look simple to apply, but in real life when many effects are present at once, judging which competing effect wins requires experience. Problems are usually easily seen, and their remedies often are too.

Second, the case of the earth's surface, the vibrational effects of a planet are strongest when the planet is in the rising sign, i.e. the direction towards which the surface of the earth is moving at the time. Each planet also has different 'aspects' in a chart: i.e. its own pattern of variation in strength round the surface of the earth, as given in *Jyotiṣa*. Directional variations like these once again present the kind of behaviour one sees in atomic orbitals, and might be derivable from quantum fields corresponding to particular superfluid vacuum states.

Third: *Jyotiṣa* and Vastu also combine to specify directional properties when an event occurs in a person's life. Properties of particular events can be read through a combination of *Jyotiṣa* charts at birth and at the time, and can specify the direction in which it occurred relative to the person - and other details. When I saw a small snake one evening in March 2014, my *Jyotiṣa* student correctly stated its direction (East), its size and colour (Small and Red), that there was water falling (it was beginning to drizzle), and the direction to a nearby temple (North). All this is possible because there are 'vibrational patterns' i.e. of high order quantum correlations,

continuously acting on the fields of all participants in an event. As a result, the 'vibrations' of one entity tend to match those surrounding other participants. In my case, the vibrations of the snake were correct and rightly placed for me to 'meet' it at that time. Similar vibrational matching happens between people: the kind of person we meet for an appointment, our relative directions, topics discussed and their outcome, can all be read from positions of planets at the time, relative to those at our birth. The level of detail can be astonishing - as in the case of my snake.

Conclusions

In these ways, Boldyreva's approach (1) may presage a great expansion in scientific thought, since it may provide the theory for phenomena recognized to exist for thousands of years, but currently rejected by the scientific community on the grounds that theoretically they are impossible. The human organism contains several, empirically recognized, *subtle* levels of function detailed above. Each of these requires a possibly different kind of new physical theory to test by experiment. The theory of feedback instabilities and criticality is quite well developed, and may describe one level of subtle phenomena quite well. (16,17) Boldyreva may well have identified another, fitting serendipitously well into the whole conceptual structure

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FIGURE 1.Vastu Vidya: Grahas Dominating Theeight Principal Directions In A Buildin

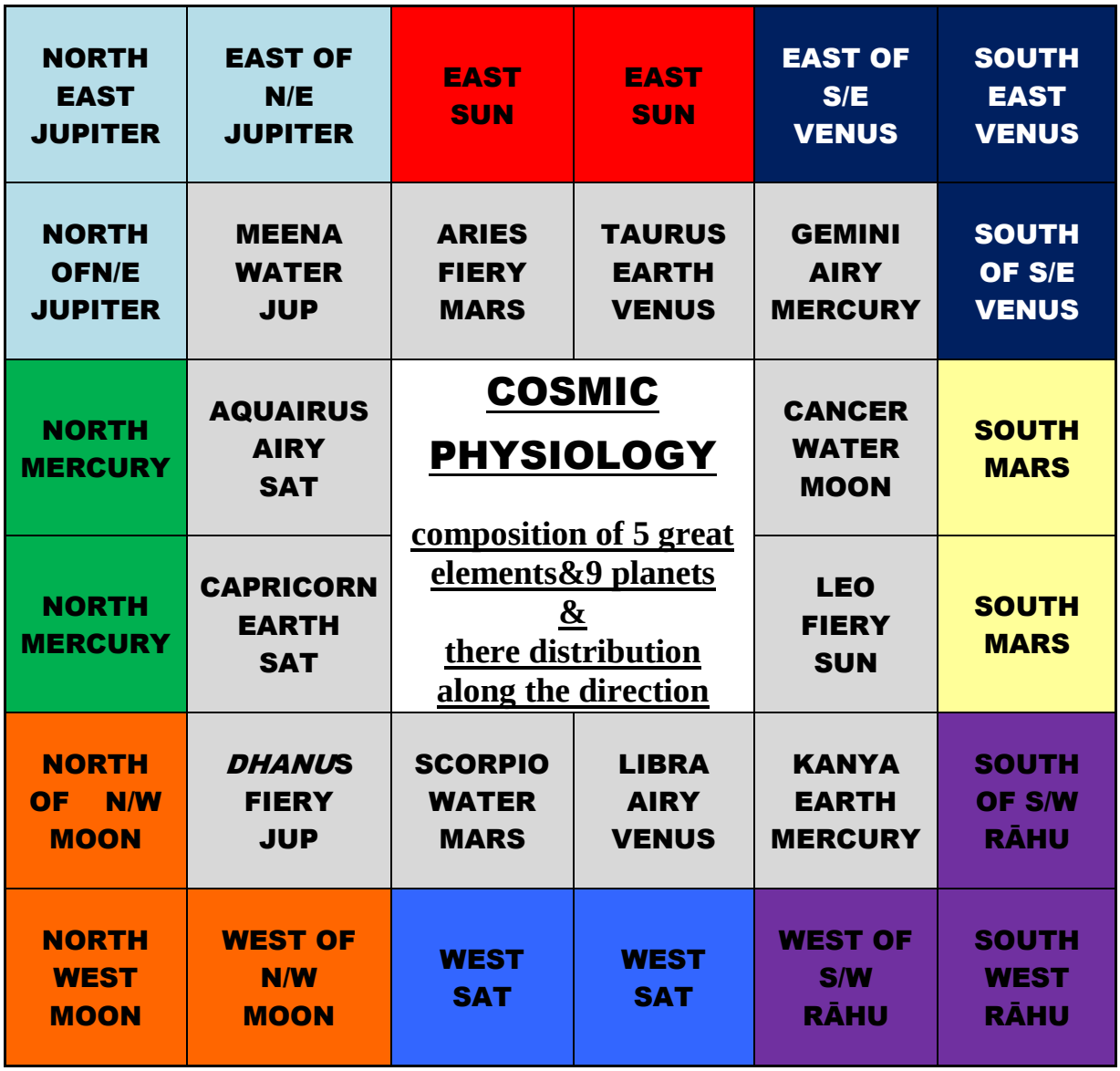

Figure 1 Caption: Figure 1 depicts the eight main directions, North, East, South, and West, and those between them, indicating which planet is activated in which direction according to India's ancient science of Sthapatya Veda / Vastu Vidya, knowledge of Vastu: Jupiter to the North-East, Sun to the East, Moon to the North-West etc. We may understand that, analogously, Boldyreva's superfluid vacuum fields may similarly take on various 'vibrational patterns' in different directions, characteristic of particular kinds of superfluid field, and that, some day, it may be possible to work out a deductive theory of Vastu. Similarly for all the examples given, once seen in complex field terms, many things seem less impossible.