'In Sympathy'

Music for CymaPhone

A portfolio of sympathetic resonance compositions enlightened by the mystical forms of *rāga* and sound healing

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Abstract

'In Sympathy' explores the phenomenon of Sympathetic Resonance generated by playing a saxophone into a grand piano tuned to *śrutis* and positioned on its side.

Sympathetic Resonance occurs when a note is played next to a passive string tuned to the same note, making the string vibrate at the identical pitch of the played note. ***Śrutis*** are microtones used in the tuning system for healing tones in *Nāda Yoga* and in the renditions of *rāgas* in Indian Classical Music.

The investigation was carried out as a practice-based PhD, with the intention of creating a portfolio of compositions that draws on these two concepts alongside researched mystical sound knowledge. The process of the research led to the creation of a new electro acoustic instrument: An augmented piano that I have called the CymaPhone. The creative output of the work is four distinctly themed composition portfolios. The four portfolios of *rāgas, sound healing, Indian New Age and In Sympathy,* show the diverse application of the CymaPhone. The aim of the investigation and PhD music is to connect the listener to the Pleroma of Sound, offering an uplifting spiritual experience.

The innovative results of the PhD will bring a wider benefit through live immersive presentations of the CymaPhone, and in the applied use of the compositions, to assist well-being.

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The PhD makes use of Indian sargam notation.
Here are the scale degrees with the corresponding sargam notations being used.

1	***b*2**	**2**	***b*3**	**3**	**4**	**#4**	**5**	***b*6**	**6**	***b*7**	**7**	**8**
Sa	Re	Re	Ga	Ga	Ma	Ma̓	Pa	Dha	Dha	Ni	Ni	Sȧ
S	R	R	G	G	M	M̓	P	D	D	N	N	Ṡ
S	r	R	g	G	M	m	P	d	D	n	N	S′

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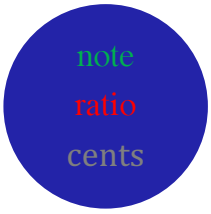

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I hope the resonance of this work fills you with the same joy I have received from the project.

Declaration

I declare that this thesis is a presentation of original work, and I am the sole author. This work has not previously been presented for a degree or other qualification at this University or elsewhere. All sources are acknowledged as references.

Chapter 1 Introduction

This introduction is an outline of the principal features of the creative investigation. It is crucial to establish that the research is rooted and immersed in diverse knowledge that intersects varied modes of understanding and practice: this pluralistic approach is tied to my mixed ancestry and multicultural upbringing. The project spans various forms including Indian Music, Western Art Music, Afro music, Christian mysticism, *Yogic* practices, improvised and written composition, and techniques from both Western and Indian instrumental traditions. This epistemological approach is an effective way to investigate the knowledge areas, especially at a time when the dominant Western epistemological method is being challenged, and humanity is working towards approaches to knowledge that embrace a plurality of worldviews.

To give context to the rest of the commentary it may be helpful to experience the CymaPhone by listening to the 'In Sympathy' Portfolio. This PhD is at its heart a compositional project and can be best understood through listening. The 'In Sympathy' Portfolio provides a clear idea of the unique sound of the SR and allows a process of immersion in the music before absorbing the technical details around its construction and creation. It may be helpful to hear the sonorities, tunings and phraseologies first, as the music will eventually have to speak for itself. The pianist and student of Gurdjieff, Thomas De Hartmann, recorded some remarks where he says that Gurdjieff found… 'music helps to concentrate oneself… and helps you to see higher.' Rather than speaking more he simply states… 'in this regard I will just play.'[1] That is the context within which the album 'In Sympathy' is offered.

The music was designed to be listened to on high quality stereo speakers. Listening on headphones or in multi speaker set ups will not give the music the correct spatial audio mix.

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[1] Thomas De Hartmann, *Remarks by Thomas De Hartmann.* CD 3, track 13 from *The Music of Gurdjieff/De Hartmann,* USA: H-H Records TCD 1001-1003, 1989.

The PhD draws on mystical sound knowledge, including 3000-year-old *vedic* sound scholarship and *Advaita Vedanta* teachings: *Kāranam* from Shri Shankaracharya's *Aparokshānubhūti* inspires the investigation through the progression from cause to effect to the ocean of silence,

> *Kārye Hi Kāraṅam' Paśyet Paścāt Kāryam' Visarjayet Kāraṅatvam'*
> *Tato Gacced Avaśišt'am' Bhaven Munih*
>
> One should indeed see the cause in the effect, and then dismiss the effect. Causality itself then disappears, and the sage becomes the ocean of silence.[2]

When the saxophone's tonal material (Causality) sympathetically resonates through the CymaPhone (effect), it unlocks the innate realm of sound, allowing the natural beauty and inherent geometry of sound to become co-composer. In my 'etheric'[3] perception of the world of sound, discovered through *nāda* yoga practice, unseen sound forms are created that are living, and through this vibrational origin waves and particles manifest form. Drawing on this esoteric concept and through the CymaPhone, the PhD is realised through a collection of original recorded composition portfolios. By ' creating tones through the CymaPhone and then standing back to 'see the cause in the effect', I was able to etherically observe sound forms and sense their natural beauty; I felt and heard the piano's vibrations as shapes seen in the simple geometric forms of nature. On discovering this, I felt a strong sense of the CymaPhone being a co-composer as 'the sage becomes the ocean of silence,': A rich ocean of knowledge that became the basis my SR research . My sense of awe for the CymaPhone's sound meant I did not know exactly why it behaved as it did, and indeed what it would do in the future, so to greatly enrich the compositional process I gave it an equal footing as sound creator at the initial stages. To further support the idea of materialsed form through sound, we can observe the soundform investigations of early acoustician Ernst Chladni (1756-1827) in his Cymatic research. Chladni

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[2] Shankaracharya, *Aparokshānubhūti*, trans. with commentary by Shri Brahmananda Saraswati, (New York: George Leone Publication Center, I.C.S.A. Press, 1988), mantra 139, 112.

[3] Annie Besant, *Man and his Bodies, (*Princeton: Krotona, California,1917) p9.

documents how sand placed on a metal plate moves into symmetrical geometric patterns when the plate becomes a vibrational resonator by using a violin bow on its edge.[4] It is interesting to note that the sand moves to where there is no vibrational movement, ie where the sound is not, a concept in keeping with the unstruck nature of *nāda yoga.*

The CymaPhone itself may have led me in predictable directions, as it afforded very specific sound outcomes. Musician Christophe de Bézenac and music psychologist Luke Windsor introduce the concept of 'affordance'[5] to music, and in pointing to the writing of Afghani musician John Baily they initially propose that the human being and musical instrument are predisposed to predicatable musical outcomes:

> the interaction between the human body, with its intrinsic modes of operation, and the morphology of the instrument may shape the structure of the music, channelling human creativity in predictable directions.[6]

Windsor and Bézenac go on to say that some 'musicians do not always take "the path of least resistance".'[7] This approach to my music making by essentially taking a more challenging path is what most interests me; by adopting a deep inner listening to the CymaPhone through my *nāda yoga* practice, I argue, I was able to go beyond the predictable outcomes, as I am a Western instrument playing *rāga* musician, playing into the body of a Western instrument, which predisposes me to going beyond these 'predictable outcomes.'

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[4] Ernst Chladni, *Treatise on Acoustics: The First Comprehensive English Translation of E.F.F. Chladni's Traité d'Acoustique.* (Cham: Imprint: Springer, 2015).
[5] Luke Windsor, W. and Christophe de Bézenac. 'Music and Affordances'. *Musicae Scientiae* 16, no. 1 (2012): 102–20. Accessed doi:10.1177/1029864911435734.
[6] John Baily Music performance, motor structure, and cognitive models. In Baumann M. P. (Ed.), *European studies in ethnomusicology: Historical developments and recent trends* Wilhelmshaven, Germany: Floian Noetzel Verlag, (1992), p142-158.
[7] Luke Windsor, W. and Christophe de Bézenac. 'Music and Affordances'. *Musicae Scientiae* 16, no. 1 (2012): 102–20. Accessed doi:10.1177/1029864911435734, p109.

To provide context to the investigation, in 1991 I began playing my alto saxophone into a grand piano with the sustain pedal permanently engaged. The process gave rise to Sympathetic Resonance (SR) from the piano's strings, mirroring the sound created by a *sitār's* sympathetic strings, *taraf.*[8] This method of generating SR became the cornerstone for this current research. To develop the initial exploration, I undertook the retuning of both the saxophone and piano to incorporate twenty-two *śrutis,*[9] thereby creating resonances rooted in *rāga*[10] principles.

The aim of this research was to discover and develop tools and forms that would ably inform the creation of *rāga* and sound healing themed compositions. During the PhD timeline I discovered and developed innovative practical tools that enabled the creation of the compositions:

- **Śruti 2:** An original piano tuning system for twelve fixed notes based on the frequency ratios of musicologist *Bharat Muni's* system of 22 *śrutis*
- Micro tuning screws and adapted playing techniques for *rāga* saxophone
- A method to get closer to the strings to create SR from a grand piano
- Close microphone techniques for recording the subtle sounds of SR
- Body-Mind approaches to creating durational sound with SR

Combining these tools allowed for the development of a new musical instrument called the CymaPhone. This instrument enabled me to generate a diverse range of sound recordings, which were used to formulate compositional techniques inspired by esoteric approaches, including practices within:

- Listening
- Sound
- Breathing

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[8] The *sitār* typically has 13 *taraf* strings, tuned to the notes of the *rāga* being played.
[9] Micro-divisions of the octave used in Indian music.
[10] The melodic form in Indian Classical Music.

- Meditation
- Healing

To demonstrate my approach to using the CymaPhone, I investigated three musical forms that were later adopted as three themed composition portfolios:

- *Rāga:* ***Kāranam***
- Sound healing: **Sound Yoga**
- 21st Century music: **Indian New Age**

The recorded compositions are based solely on the SR, representing instrumental music that offers an immersive sound experience. The composed music embodies the PhD's unique and original contribution to knowledge in the areas of SR, *rāga,* sound healing and Indian New Age composition.

Rationale for the Project

The projects creative inspiration draws from extensive training, performing and teaching in Indian Classical Music (ICM), spanning over 35 years. Additionally, it is influenced by knowledge of Sound Healing and my practice of *Nāda Yoga*, the *Yoga* of sound. To give context to the esoteric and *Yogic* nature, here are two inspirational quotations. The first describes OM,[11] the primary practice tool in *Nāda Yoga*:

> *OM* stands for the supreme reality. It is a symbol for what was, what is, and what shall be. *OM* represents also what lies beyond past, present, and future.[12]

The second quotation is a good insight into my use of esoterically researched sound in this project: sound creates form, and these forms will either create,

[11] OM is the sounded form of the three letter Sanskrit *bīja* syllable A-U-M.
[12] Madhva, active 13th century, *The Commentary of Śrī Madhav on Mandukya Upanishad* (Bombay: Vasantik Prakashan, 1990), 1.1.

weaken, or destroy our collective progress. As composer and author Randall McClellan notes,

> The Lamas of Tibet have developed a science as well as an art of sound. They carefully cultivate sensitivity to musical pitch and tone and to the moods thereby created which they believe have the power to heal or, if misused, cause illness, according to the vibrations involved.[13]

My lived experience of *rāga* music and *Nāda Yoga* has sensitised my hearing as a musician, especially in my everyday environment, and as a result has reinforced my belief that humanity has collectively created a world increasingly polluted by noise. These noisy and often randomised and at times discordant frequencies, sounded in fast-paced commercialised urban centres, are both disturbing and damaging to our hearing, being and environment, and add to the creation of our modern desire for unsustainable and over-consumption of the Earth's resources. I argue that there is a critical need for music to counter this frenetic buzz and destructive course with meticulously researched and heart-centered[14] empathic sound that relates to the needs of the listener, bringing long term inner balance through the creation and absorption of harmonious sound.

My sound perceptions are guided by my cultural influences and my understanding of music and listening: These sound experiences are perhaps culturally pre-conceived for all of us, as anthropologist Stephen Feld points out in his discourse on 'acoustemology,' a word invented by Feld, as a combination of the words 'acoustic' and 'epistemology.' In defining acoustemology Feld says:

> It asks how the physicality of sound is so instantly and forcefully present to experience and experiencers, to interpreters and interpretations. Answers to such questions do not necessarily

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[13] Randall McClellan, *The Healing Forces of Music, History, Theory and Practice* (San Jose, New York, Lincoln, Shanghai: toExcel, 2000), 46.
[14] In mystical traditions one of the journeys embarked upon is to quieten the lower mind and direct the consciousness to the heart.

> engage acoustics on the formal scientific plane that investigates the physical components of sound's materiality (Kinsler et al. 1999). Rather, acoustemology engages acoustics at the plane of the audible.[15]

This insight into the interpreted experience of sound suggests, we as listeners and of course creators are open to different interpretations of sound and its associated concepts, concepts that can reveal to the listener, and in this case myself as a composer, a perception of sound in a certain point in history and/or culture. Given all of this, the mystical quotations in this writing are presented in the context of my cultural and acoustic leanings, within a practice led and creative research project. The ideas shared here were central to enrich my own inner intention to create the works; essentially the quotations became artefacts of the researched creative process. I am aware that the translation and context of texts from the past can be problematic, which is why I am not sharing them as facts and instead as an indication of works and materials that influenced my own inner thought and feeling processes whilst composing. So on that note we return to some inspired words to give an insight into the creative influences of this work.

Esoteric sound practices assist music creation reflecting a primordial view of music's original function, as described by Confucius, in the *Li ji* (400-200 BCE),[16]

> music is the necessary expression of satisfaction in the resulting beauty and harmony[17]

and Plato, in the *Timaeus*,

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[15] Stephen Feld. *Acoustemology*. *In Keywords in Sound*, edited by D. Novak and M. Sakakeeny, (Durham and London: Duke University Press, 2015), 12-21.
[16] Also called the *Book of Rites*.
[17] James Legge. *Sacred Books of The East vols 27 and 28,* (Oxford: Oxford University Press, 1885), 24.

> And to the same end too they gave sound and music and harmony and rhythm, that we might bring order from disorder in our souls.[18]

Perhaps this PhD can serve as a signpost for composers to again respond to the universal laws of sound, where sound is seen as a medicinal healer, or like how musicologist Alain Daniélou described,

> the true role of music, as Plato said: "Music whose movements are of the same kind as the regular revolutions of our soul, does not appear, to the man who has intelligent intercourse with the Muses, to be good merely for giving physical pleasure, as seems to be the case in our day. On the contrary the muses have given us music as an ally of our soul, in its attempt, to bring back order and harmony into those periodic movements that had become disorderly in us."[19]

Cyril Scott (1879-1970), musician, mystic and author understood well the connection of spirit and sound, and he was able to convey his lived experience of mystical sound as a composer and musical commentator: Scott wrote about the role of music across Western history, and he emphasises the spirit-sound connection when he suggests that Beethoven,

> was the first European composer to restore music to its original function-that of constituting a definite link between man and God.[20]

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[18] R.D Archer Hind, *The Timaeus of Plato* (London: Macmillan and Co, 1888), 154.
[19] Alain Daniélou, *Music and the power of Sound: The influence of tuning and interval on Consciousness* (Rochester, Vermont, USA: Inner traditions International, 1995), 122.
[20] Cyril Scott, *The Influence of Music On History And Morals: A Vindication Of Plato* (London: The Theosophical Publishing House Ltd, 1928), quoted in Roberto Assagioli, Chapter 6. "Music: Cause of Disease and Healing Agent Music," in *Physician for Times to Come*, ed. Don Campbell (Wheaton, Illinois. Chennai, India: Quest Books Theosophical Publishing House, 2006), 106.

This link to a higher consciousness through sound is the broader context for the project and calls upon esoteric concepts and practices to carry out the research to create the portfolio of compositions.

CymaPhone: Discovering the tones

The CymaPhone is characterised by its unique *śruti* tuning, the side mounting of the piano and the electro-acoustic recording process. These elements distinguish the instrument's distinctive timbre, mechanical operation, and the aesthetic of the musical compositions within the portfolios. During the process of creating SR from the CymaPhone, it was necessary to classify the sounds being generated. This enquiry led to considerations of the concept of 'tone', something inherent in *rāga* music, perhaps in contrast to the Western concept of a musical note.

The earliest documented use of melodic tones found in India is first referred to in the *Sāmaveda*,[21] which defines the *Sanskrit* word *svara*, meaning 'to sound'. The *Sāmaveda* is chanted using three tones, where the central tone is called *svarita*, from the word *svara*. *Svaras* are, in Western musical terminology, the 'musical notes' in Indian music, but are perceived by *rāga* practitioners as tones: in ICM, *svaras* are seen as living organisms, which is why in the *rāga* form they are referred to as tones. A note becomes a tone when life is breathed into it, and composer, Theosophist, Astrologer and Indian scholar Dane Rudhyar (1895-1985) introduces us to this idea: 'A tone is a living cell.'[22] In its origin a tone is pure vibration and is essentially universal sound being made manifest. Having been transferred to humanity, these living tones must have an expressive quality to maintain a link to universal sound; a tonal expression that goes beyond the mere dataset of instrumental notes being notated or played. Instruments in India were constructed originally to mimic and measure the universal sounds of nature and

[21] Ralph T.H. Griffith, *The Sāmaveda Saṃahitā (The Vedas, Vol.4)* (Great Britain: Kshetra books, 2017).
[22] Dane Rudhyar, *The Rebirth of Hindu Music* (Adyar, India: Theosophical Publishing House, 1928), 18.

the human voice.[23] To follow this Heaven to Earth, Spirit to body transmission, the true Indian musician senses a clear distinction between tones and notes. Inspired by this Spirit to body transmission, this investigation explored a body to spirit, cause to effect, saxophone to CymaPhone transmission, with music that is in keeping with the mechanics and universal sound ideals of *rāga* music and tonal composition. The PhD is an exploration of the unique, and discovered living tones that have been researched, produced and recorded through the CymaPhone with the aim to produce tones that are suitable for compositions inspired by *rāga* music, sound healing and microtonal composition.

In this work the word 'note' refers to the acoustic pitch, either in hz, ratios or note names in Roman script or Indian *Sargam*.

Research Framework

Given the synthesis of ideas in the project, it has been vital to centre the research within a framework, and outline the primary intention and practical approach of the PhD investigation. By creating and working with this framework I was able to retain the inner feeling of the work when considering and creating the Research Design, as laid out in Chapter 3.

Inspired by the unfolding-enfolding process of *Nāda Yoga,* I have documented four key areas of research to draw attention to the source and function of each knowledge area. They functioned as:

- *Intention*
- *Ideation*
- *Imagination*
- *Creation*

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[23] Śārṅgadeva, *Sangītaratnākara of Śārṅgadeva, Vol I, treatment of svara,* trans. Dr. R. K. Shringy (Delhi, Varanasi, Patna, India: Motilal Banarsidass, 1978), 21-3.

Intention was explored through *esoteric* forms, where the research was grounded in various spiritual practices, either mystical, musical, or physical: - the intention was to become attuned to music appropriate for sound healing.

Ideation was explored through musical knowledge of *rāga* and *śruti* tuning, where inner ideas were explored intuitively through the forms, colours, tones, and expression of specific ICM *rāgas* and their corresponding *śruti* tunings.

My *imagination* was engaged in the *composition* process, where I observed my inner sound world to design the compositional forms.

Creation was the production of the electro acoustic recordings of the CymaPhone to create the PhD compositions.

Akin to the *Nāda Yoga* path, these four areas were considered and handled in the specific order above. This order can be considered as a way to materialise form, from subtlest to grossest, from ether to solid. To illustrate and uncover further insights into this process, we can consider these four areas in the opposite direction:

- *Creation*
- *Imagination*
- *Ideation*
- *Intention*

This order now mirrors the enfolding process of sound *yoga*, where the aspirant first chants a *mantra*[24], *Creation*, then hears this *mantra* in their mind, *Imagination*, then brings the *mantra* to the level of feeling in the inner heart, *Ideation*, and then

[24] In this instance *mantra* is used to describe a word or sequence of words repeated to aid meditation, originally sung or spoken in *Sanskrit*, and can literally be translated as 'mind instrument.'

they may be able to enter the soundless sound,[25] *evamomkara atmaiva*,[26] the origin of their being, *Intention*.

The 'soundless sound' is a mystical way of describing the undescribable. As Indian mystic, spiritual leader and musician Sri Chimnoy states

> AUM is called the soundless sound because we do not strike any object with any other object in order to produce it. Because it is unstruck, it is known as the soundless sound. In Sanskrit, this phenomenon is called *Anāhata,* which means literally 'unstruck'.[27]

This paradox is one of the keys that can unlock the door to our inner sound world, and is available to one who can deeply listen and live in the centre of their silent being.

It has been helpful to see this ordered process in two ways to give an insight into the listener's experience: *Creation* to *Intention* and the composer's creative process: *Intention* to *Creation*. This research concept can be modelled onto future creative processes, serving as a tool to integrated thinking in collaborated esoteric and academic research; especially with the growing calls for a paradigm shift towards knowledge discovery through an epistemological pluriverse.[28]

Each of the above four areas has its own associated vocabulary that is used throughout the commentary. For the *esoteric* research the words are simple, which ties in with the practice: I employed a spiritual approach to 'get out of the way' and allow an inner sound experience and the outer piano sound to be the main music creators. This approach is individualistic in nature, and therefore not straightforwardly quantifiable. In this commentary, however, is documented

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[25] The soundless aspect of the universal sound OM. From Mandukhya Upanishad 6th Century BC, attributed to Gaudapada in his commentary Mandukya Karika.
[26] Madhva, active 13th century. *The Commentary of Śrī Madhav on Mandukya Upanishad* (Bombay: Vasantik Prakashan, 1990).
[27] Sri Chimnoy from https://www.srichinmoylibrary.com/lbl-16 accessed Nov 3, 2024.
[28] Ashish Kothari, Ariel Salleh, Arturo Escobar, Federico Demaria, Alberto Acosta, eds. *Pluriverse: A Post-Development Dictionary*, (Delhi, India: Authors Up Front/Tulika Books, 2019).

some spiritual practices that assisted me in unearthing the intention for some aspects of the project, which highlighted a need for a holistic and multi-faceted approach to the research. For the *rāga* and *śruti* tuning research the vocabulary draws on *vedic* text, *Sanskrit*[29] interpretations, and musical terminologies associated with *rāgas* in ICM. For the *composition* research, creative and standard Western music vocabulary is employed. For the *CymaPhone* recordings, there is a documentation of the practical and technical aspects of the research, in its simplest sense the undertaking of the work.

Here is more insight into these four areas. Some aspects are straightforward to explain, and other aspects need more careful exploration.

Creation: The material substance of the project is the creation of the recordings produced through the CymaPhone**,** which are formed into the compositions. These compositions were then organised into the three distinct composition portfolios:

- *Rāga*
- Sound Healing
- Indian New Age

There is a fourth portfolio which showcases pieces from all three compositional styles in a traditional musical album presentation, which was a useful way to highlight the differing compositional styles, and to draw all the threads together into one curated portfolio.

Imagination: Each portfolio was composed using an array of music devices, using my imagination in measured approaches to create the compositional forms. I was aiming to create an array of compositions for using alongside my sound healing work after the PhD, and as such was spurred on to create music that had a profound effect on the listeners well-being. This was achievable

[29] From circa 1500 BC literally meaning pure and perfect, or sacred.

through the totality of the research, and through my creative imagination and spiritual openness. These ideas are explored further in Chapter 4.

Ideation: The research draws on the concepts of *rāga* music and *śruti* tuning theories as the main sources of melodic inspiration and modal tuning application. *Rāga* in its mystical origin relates to the essential energies of Hindu deities formed in a *Yogi's* consciousness through the paths of *Dhyāna (*meditation), *Bhakti* (devotion), *Śakti* (energy) and *Nāda* (sound) *Yogas*. The dedicated practice of these *Yogas* enables one to connect with the essence of melodic creativity through the inner senses. As an expressive form, *rāga* has an uninterrupted oral music tradition dating back many thousands of years: The origins of *rāga* in literature is first found in Mataṅga's Bṛhaddeśī (c.600-700 CE),[30]

> the first time Mataṅga defines the term *rāga* (III. 263-4)[31]

From an aural and developmental perspective *rāga* can be traced to the chanting of *bīja mantras*,[32] [33] the seed mantras in *Nāda Yoga* that are monosyllabic vocalisations containing the essence of a deity in the *Tantric* tradition, including AUM, AIM or GAM,[34] where AUM is connected to *Parabrahma* (Supreme God), AIM to *Sarasvati* (Goddess of Knowledge and Music), and GAM to *Ganesha* (elephant-headed God and remover of obstacles). These mantric syllables are employed to connect to the essence of a deity and in time expanded into creative vocalisations and songs to create the *rāga* form. These *mantras* are first documented in the *Vedas* (1500-500 BCE), though we must consider that *Nāda Yoga*, due to the intuitive origin of *mantras*,

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[30] Mataṅga, *Mataṅga and his work Bṛhaddeśī,* ed. Prem Lata Sharma (Delhi: Sangeet Natak Akademi, 1995), 27.
[31] Ibid., 219.
[32] Śārṅgadeva, *Sangītaratnākara of Śārṅgadeva, Vol I, treatment of svara,* trans. Dr. R. K Shringy (Delhi, Varanasi, Patna, India: Motilal Banarsidass, 1978).
[33] David Frawley, *Mantra Yoga and Primal Sound: Secret of Seed (Bīja) Mantras* (USA: Lotus *Press*, 2010), 25.
[34] Ibid. 87-98.

> *mantra* is a word of power and light that comes from…some very high plane of Intuition.[35]

were most likely initially experimental; an early form of practice led research through the *guru śiṣya parampara* (master-student legacy), where the *śiṣya* (student) learnt directly from the *guru* (master).[36]

The word *śruti* in relation to the *Vedic* tradition has a two-fold meaning: Initially, it is believed that the knowledge of the *Vedas* was originally heard by sages during deep meditation. This root knowledge was passed down orally from sage to sage and not originally written down, which is why this knowledge is said to be *śruti*, as musicologist R. K. Shringy notes in his translation of *Sangītaratnākara*,

> *śruti-s* literally could be rendered as audibles[37]

The *Vedas* were eventually recorded and compiled by the sage Vyasa (c.1500-500 BCE) in four *parts*, with each *Veda* having four further subdivisions including the *Brahmanas (*commentaries) and *Upanishads* (discussions) on each subject. Here we see a model of learning through divine wisdom, through the path of doing, feeling, and thinking. The *Vedas* can be considered as the origin of *rāga,* even though there is no direct use of the term *rāga* in the *Vedic* texts. If one reads the *Vedas* one must bear in mind the oral lineage and importance of that which is *śruti.* This contrasts with the word *smṛti* (what is remembered), which are the texts that involve authorship and are based upon the *Vedas*. The investigation was more concerned with the theoretical concepts of *śruti* in respect to tuning in current ICM, though the origin of the word reveals the mystical origins of *rāgas* and *śruti* tuning. Using these ideas, I conducted practical *rāga* based research with voice, saxophone and CymaPhone to nurture an inner sound vision. This unfolding was linked to an immersion into *Yogic* chanting and *rāga* singing,

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[35] Sri Aurobindo, *The Future Poetry, and letters on poetry, literature and art* (India: Birth Centenary Library, 1972), 369.
[36] Personal conversations with my Indian music Guru Pandit K. Sridhar.
[37] Śārṅgadeva, *Sangītaratnākara of Śārṅgadeva, Vol I, treatment of svara,* trans. Dr. R. K Shringy (Delhi, Varanasi, Patna, India: Motilal Banarsidass, 1978), 115.

which has been key to the unlocking of the musical tones and was fundamental to acquire and internalise the essence of the *śruti* tuning and *rāga* forms.

Intention: I began the PhD with the intention to create music based on the principles of sound healing. As music therapist Barbara J Crowe notes… 'Our word "heal" comes from the Anglo-Saxon *hal* meaning whole.'[38] Psychosynthesis doctor Roberto Assagioli states that... 'Music can be a powerful healing agent.'[39] Healing practices can bring the recipient from a state of unease or disease to a state of peace by supporting the body's natural balance and immunity and by stimulating the unconscious of the recipient's energy-body to aid the repair of cells, tissues, and bodily functions. Healing is an ancient science that works with human spirit-energies through the invisible bodies of soul/spirit, mental/causal, emotional/astral and etheric. Some of the works are directly inspired by sound healing practices and composers whose intention was to create sound healing and/or esoteric music.

Sound healing in its modern use, is mainly a practice whereby a sound healing practitioner works on a one-to-one basis with a client or patient. The sound healer uses sound as an intervention in a one-on-one therapeutic scenario for the purpose of improving the client's health. The wellbeing effects of sound healing are felt physically, emotionally and mentally; hence it may be considered as a holistic practice. The healing occurs via sound vibrations played by the practitioner and heard by the client; therefore, it is an aural based modality. There are some sound healers who use the physical vibrating of a vessel upon a body or electronically produced frequencies as sound healing methods; I am not considering those in this project, as the composed works with sound healing themes are based only on a listening modality. In my time as a musician, I have

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[38] Barbara Crowe. "Music – The Ultimate Physician," in *Music, Physician for Times to Come, an anthology by Don Campbell*, ed. Don Campbell (Wheaton, Illinois. Chennai, India: Quest Books Theosophical Publishing House, 2006), 112.
[39] Roberto Assagioli, Chapter 6. "Music: Cause of Disease and Healing Agent Music," in *Music, Physician for Times to Come, an anthology by Don Campbell*, ed. Don Campbell (Wheaton, Illinois. Chennai, India: Quest Books Theosophical Publishing House, 2006), 102.

received and conducted sound healing, and this compositional research is based on my knowledge within the oral based field of sound healing.

I am not writing this PhD to give scientific insight, or context into sound healing scholarship, though it is important to note some of this scholarship for the reader to understand my motivations for creating sound healing compositions. There has been in modern times notable work in sound healing research, including that of musicologist Penelope Gouk's investigations, where she writes that sound is intended to:

> recover an authentic golden past, to restore harmony to a chaotic present world, and to heal and restore the soul. [40]

A concept very much in tune with the ideals of sound healing. By taking a qualitative approach to sound healing research we can find useful ethnographic studies that exist to show the power of sound healing techniques, including that of Shelley Snow who unveils how sound healing produces:

> effects such as the release of emotions and trauma, a change from negative to more positive thought patterns, the elimination of physical pain, relaxing, calming effects and receiving deeper perceptions of life situations[41]

Whilst sound healing has ancient links, the more modern modality of music therapy has been accepted as a viable science, where there is presently a large body of research and many academic training oportunties[42] to become a music therapist, and employment opportunties in mainstream health and educational organisations worldwide[43] as a music therapist. Perhaps to develop and integrate sound healing into this enriched research area, the work of Barbara Crowe and

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[40] Penelope Gouk. In Search of Sound: Authenticity, Healing and Redemption in the Early Modern State. *The Senses and Society*, 2(3), 303–328 (2007).
[41] Shelley Snow. *Healing through sound: An exploration of a vocal sound healing method in Great Britain.* PhD diss., Concordia University, 2011.
[42] https://www.bamt.org/ accessed November 7, 2024.
[43] https://www.bamt.org/bamt/international accessed November 7, 2024.

Mary Scovel investigates the combined areas of music therapy and sound healing. Crowe and Scovel take a critical look at Music therapy and in an article they write

> It is the opinion of the authors that music therapy and sound healing are related and may be two facets of a continuum of healing with sound and music. [44]

Whilst I am not advocating for music therapy or sound healing, I have designed this project to incorporate inspiration from an array of lived, written, academic and orally learnt sound healing concepts, which are outlined in the thesis.

Summary

Having established a clear understanding of the researched knowledge areas and developmental direction for this project, I immersed myself into a practice-based investigation to explore the palette of tones created by the CymaPhone. Refining this a stage further, I went on to research and uncover a palette of tones suitable for composing using *rāga* and sound healing forms. These *rāga* and healing tones further inspired ideas to frame the discovered tonal palette within a variety of what can be termed 21st Century or Indian New Age musical forms. This involved seeking the edge of my musical style by challenging my existing modal compositional methods, which are rooted in *rāgas*.

Outlined is an understanding of researched *vedic*, mystic, music and sound healing knowledge to create a practice-led composition PhD, that also demonstrates the viable use and original contribution of the CymaPhone. The PhD merges traditional Indian *rāga* and *Vedic* knowledge with Western mystical and musical practices, resulting in a set of distinctive compositions, which is showcased in the creation of a unique electro-acoustic instrument. The composition portfolios and this commentary, document and demonstrate the

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[44] Barbara J. Crowe, Mary Scovel , *Music Therapy Perspectives*, Volume 14, Issue 1, 1996, Pages 21–29

originality of this approach. By creating this work, it establishes a basis for future exploration where the CymaPhone will serve as a valuable resource for producing music that can enrich and support our everyday health needs.

Chapter 2 Research Context

My musical training and performance career has involved a wide variety of musical influences and research and development (R&D) approaches, which have been uncovered within an arts-based music practice focused on producing high level performance-based productions for international audiences. As my earlier approach was concerned with the development of a creative practice, the focus has been pragmatic, rather than academic. Additionally, as an Indian musician and composer who is creating *rāga* and sound healing inspired music, there is a strong argument to bypass what can become a culturally restrictive academic approach to creative practice. Given this challenge, the investigative aspect of the work has been carefully organised with respect to the living traditions of embodied creative and spiritual practices. Essentially the approach to the research is more conducive to the knowledge systems this project is built upon, as the knowing reveals itself in the doing and feeling: As Esotericist and founding Anthroposophist, Rudolph Steiner (1861-1925) puts it,

> Our willing is weakened rather than strengthened by thinking.
> Our feeling is weakened rather than strengthened by thinking.[45]

Motivations

The primary motivation for this compositional project was to create music that invites the listener to slow down their whole being and tune into their own inner wisdom. During the PhD timeline I discovered new information about my ancestral Indian past. In the period (1850-1890) that my Indian ancestors gave up their temple-based life as *Hindu Brahmin* priests, to become Christian missionaries, the British Empire was setting up the Royal College of Music and other Royal institutions in South Kensington with wealth acquired from India. This personal discovery may have unknowingly motivated me to illuminate the

[45] Rudolf Steiner, "Esoteric Instructions, GA270, Second Lesson in Prague," *rsarchive*, accessed July 3rd, 2024, https://rsarchive.org/Lectures/GA270/English/SOL2023/19240405-JR.html.

beauty of Indian music alongside Christian mystical knowledge, seeking to integrate an Eastern mind and Western body into harmonious unity through sound. These motivations may sit neatly within the current decoloniality research sphere, where ethnomusicologists like Deborah Wong are evaluating and evolving their positions within music academia

> Indeed, many of us still view ourselves as disenfranchised interlopers, trespassers, and meddlers, but the gatecrasher—in some places[46]

I would not place myself as a decoloniser, more so I am being the work and creating the work and representing the tradition through my doing. However, there are some potential resonances with decolonial ideas: Part of what I am doing by focusing on masters and scholars from oral traditions, rather than those situated within the Western canon, all be it as 'decolonisers' of that canon, (eg Wong) is challenging the emphasis on an 'academic' approach to the concepts I explore, in favour of an exploration of far broader historical insights which are more relevant and appropriate for the tradition in which my work is situated. As such my work speaks to the idea of a 'pluraverse',[47] that is 'a world in which many worlds fit.'[48] What I have sought to do through this commentary of my practical work is demonstrate that the aural and mystical traditions that have inspired this work be considered 'worlds' that can inhabit academic discourse alongside those of the Western canon.

Positionality of the research

I have included a brief biography to give context to my approach to the PhD. The commentary is not politically motivated, though as my personal history was and is unavoidably tied up in the British Empire's colonising of India it seems

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[46] Wong, D. (2014). Sound, Silence, Music: Power. *Ethnomusicology*, *58*(2), 347–353. https://doi.org/10.5406/ethnomusicology.58.2.0347
[47] Ashish Kothari, Ariel Salleh, Arturo Escobar, Federico Demaria, Alberto Acosta, eds. *Pluriverse: A Post-Development Dictionary*, (Delhi, India: Authors Up Front/Tulika Books, 2019).
[48] Ibid, p6.

pertinent to highlight this connection. One of the motivations for this commentary is to contribute to the praxis[49] currently being adopted and researched in Higher Education around the decolonising process,[50] and to assist in a healing resolution for all sides, and as such the reflexive process has been useful in unfolding aspects of the research.

As a person of mixed British and Indian heritage, growing up in Multi-Cultural Tottenham in London, during the 1970-80s, I am well placed to investigate music that combines Western methods with an Indian approach.

On my maternal side, my great-great-Grandfather, John Lazarus (Picture 1), made the first full English translation of the famous Tamil book of verses, *Thirukkural*.[51]

Picture 1[52]

John Lazurus seated middle row, Madras (Chennai), 1899.

Lazurus' father, a high caste Brahmin, converted from Hinduism to become a Christian missionary in the 1800s, so why was Lazurus encouraging Tamil religion and philosophy?

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[49] see Paulo Freire, 1921-1997. *Pedagogy of the Oppressed*. (New York: Continuum, 2000).
[50] see Bhambra, Gurminder K., Dalia Gebrial, and Kerem Nişancıoğlu. *Decolonising the University* (London: Pluto Press, 2018).
[51] Thiruvalluvar, *Thirukkural*, Circa 300BC-400AD, trans. W. H. Drew and John Lazurus (New Delhi: Gyan Publishing House, 2020).
[52] "Missionary John Lazarus and family. Madras. 1899." (Photograph, International Mission Photography Archive, CA.1860-CA.1960, USC Digital Library. IMPA; Danmission Collection).

In 1948, during partition, my Indian mother, Tara Fonseca, and her Mumbai based family left behind their home in India to take a three-month boat journey to Canada (**Error! Reference source not found.**2), sacrificing cultural and material possessions.

Picture 2

l to r 2nd row Dorothy and Bernard Fonseca,
front row Reba, Esther and Tara Fonseca, 1948.

My initial musical training occurred during my childhood. My British father played eclectic music LPs all day every day, exposing me to Indian Music, Jazz, Richard Wagner, George Gurdjieff, Arvo Pärt, John Coltrane, Albert Ayler, Terry Riley, La Monte Young, John Adams and other New Age[53] and non-western music. The mood of such works in my father's record collection has always fascinated me and served as an important reference point in my compositions. Since childhood I have spent time with Frank Perry, my father's lifelong friend, who is among many other things a world-leading singing bowl and gong expert, composer, sound healer, and astrologer.

The research and creation of the CymaPhone was greatly influenced by Perry's music and knowledge of sound: Perry sparked numerous discussions on topics such as music, approaches to tuning, literature recommendations, sound healing,

[53] New Age Music was a term used to describe music first created in the 1960's that drew on Eastern music to generate spiritual experiences through sound. Tony Scott's *Music for Zen Meditation* (1964) is considered the first New Age album.

rāga, Himalayan singing bowls, and composing. These discussions were a direct source of inspiration for the compositional and theoretical parts of the project.

As a teenager, in the late 1980s, I attended long weekend London house parties and hung out in London basement clubs, where I gained a love for dance floor Jazz, Hip Hop and Reggae.[54] I participated as a performer, social dancer and DJ, which initiated my passion for creating my own music. Throughout my career, I continued to pursue my love for recorded music and became a music producer in 1995. This music studio experience was a useful foundation for me to create the CymaPhone and compositions as recorded material, which required a high level of awareness to the production process, sonic detail and recording science.

From 1991-94 I studied 20th century Western Classical music and Jazz to degree level at Leeds College of Music.[55] I studied the works of French composers, whose tonal approach to composing has stayed with me throughout my career, and I have referred to the approaches of the piano works of Claude Debussy, Maurice Ravel and Erik Satie in some of the works.

I have trained for 30 years as an Indian musician. My training began with lessons from *sitārist* Ustad Dharambir Singh MBE and continued with vocalists Pandit Rajan and Sajan Mishra, *sarodiya* Pandit Rabi Chakraborty, *sitraist* Pandit Arvind Parikh, vocalist Pandit Ajoy Chakraborty and most recently with *sarodiya* Pandit K. Sridhar. I trained for 20 years as a Brazilian percussionist with master musicians, learning Brazilian and Afro music from Bosco D'Oliveira, Sam Alexander and Dudu Tucci. In the creation of the CymaPhone and in the portfolios, my Indian music training serves as a significant reference point.

Since 1987, I have worked with National Orchestras, International ensembles, and have been an educator teaching Western, World and Indian music in various

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[54] Dingwalls, in Camden, London was a meeting point for musicians and dancers, where Gilles Peterson (Acid Jazz Records/ Talkin' Loud) and Patrick Forge (Kiss FM) were DJs on Sunday afternoons.
[55] LCM, now called Leeds Conservatoire, was founded in 1965 by Joseph Stones and launched the first jazz degree in Europe.

settings including Higher Education, Further Education, schools, workshops, and online platforms. I have collaborated with institutions, colleagues, and students to design degrees, modules, projects and certifications to create clear pedagogical processes to guide music students. Through my professional practice, I have gained valuable production and artistic experience by creating music with leading dance companies, artists, street performers, and filmmakers. This has enabled me to develop the skills necessary for creating immersive art and music that engages the listener.

I have included some pieces in the Indian New Age Portfolio created within the PhD timeframe in collaboration with a painter, filmmakers, choreographer and soloists to test the creative limits of the work. In my abstract and introduction, I have outlined how the CymaPhone investigation was a process of development through testing ideas and creating immersive music. By working with other non-music artists, I was able to further test the language and approach of the CymaPhone which broadened the immersive possibilities within the works.

As established in the introduction the project is framed using four areas of research activity: Intention, Ideation, Imagination and Creation. Expanding on these research areas outlined below are insights which can point the way to enlightening the context for this PhD.

Intention: Sound through the ages within an esoteric approach

The investigation has been inspired by music that offers the listener an opportunity to reconnect with a Universal sound source and receive a soulful experience that allows peace and inner wisdom to be developed by the listener. There is a reference to the music and composers that have directly influenced this work, where the common theme is not genre, epoch or culture based, more so it is based on their desired intention to raise the listeners consciousness to a higher realm of experience. In this way 'In Sympathy' is an attempt to draw upon experiences of the musical and sound healing works of composers that include

Frank Perry,[56] Tony Scott,[57] John Beaulieu,[58] David Hykes[59] and Pandit K.Sridhar,[60] along with esoteric knowledge, including that of Steiner,[61] Hazrat Inayat Khan,[62] David Frawley,[63] Swami Rama[64] and Russill Paul,[65] to create compositions informed by practice-led sound research, composed with the intention of assisting the listeners health.

Throughout the ages, sound has been used as a principal healer, employing and dispensing deeply considered and subtle tones to people with diseases whilst inside sacred and acoustically harmonious spaces, providing the human threefold nature of mind, body and soul the opportunity for healing and to be brought back to wholeness.

Through my study with Pandit K.Sridhar I was able to gain insight into the world of a vedic sound healer, or as Sridhar himself puts it

> Healing through sound is not I am going to play and heal you. Sound healing should come unannounced. If you play music and someone comes and says they felt healed then that is sound healing[66]

This approach to playing music is rare today, as with the separation from sound as medicine, music has mainly taken on the everyday function of entrainment

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[56] Frank Perry, *Deep Healing Peace*, Mountain Bell Music, Bell CD 022, 2007, CD.
—. *Messenger of Beauty*, Mountain Bell Music, Bell CD 027, 2010, CD.
[57] Tony Scott, *Music for Zen Meditation*, Verve,1964, CD.
[58] John Beaulieu, *Calendula*, Relaxation Company, 1997, CD.
[59] David Hykes, *The Harmonic Choir Hearing Solar Winds*, Ocora, 1983, CD.
[60] K. Sridhar, *Live from Paris, '82, vol 1 and 2*, SK Music, 2020, CD.
[61] Rudolf Steiner, *The Inner Nature of Music and the Experience of Tone*, (USA: Anthroposophic Press, 1983).
[62] Hazrat Inayat Khan, *The Mysticism of Sound and Music* (USA: Shambala, 1996).
–, *Spiritual Dimensions of Psychology* (USA: Omega Publications, 2012).
[63] David Frawley, *Mantra Yoga and Primal Sound: Secret of Seed (Bīja) Mantras* (USA: Lotus Press, 2010).
[64] Swami Rama, *Om the Eternal Witness: Secrets of the Mandukya Upanishad (*USA: Himalayan Institute Hospital Trust, 2008).
[65] Russill Paul, *The Yoga of Sound (*USA: New World Library, 2006).
[66] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024. An interview dated December 3rd 2024, that was conducted to clarify and augment the learning that took place with Sridhar 2020-24.

and entertainment, inspiring cultural celebration, perhaps at the cost of connecting the listener to the healing qualities of sound. I have been inspired by an array of sound healing approaches that have been documented from ancient times (c50,000 BCE) through to modern day well-being music. These inspirations include insights from Ancient Egypt,[67] where temples and pyramids were built to house sound healing experiences.

A revival of ancient musical principles came about through the re-emergence of what was inconsiderately called, at the time, 'Oriental' or 'Eastern' cultural exposure in Europe in the late nineteenth and early twentieth century. This exposure and fascination of new culture in the West has led to modern scholarship on sacred sound in South Asia, where much has been written about and discussed through the work of Western academic scholars incuding Frits Staal,[68] who was a lecturer at the School of Oriental and African Studies from 1958 and then in the USA and Holland; meaning his research influenced a host of vedic scholars, and he is highly regarded in the scholastic field.

> Staal, who knew Vedic ritual traditions better than most[69]

A bold claim made by a Western scholar on the knowledge of South Asian written and oral traditions of a fellow Western scholar. Maybe he means from a Western perspective. This idea of scholarship leads to many conflicts for me, especially as the mysical and creative aspects of OM and mantra go far beyond a schorlarly enquiry, and in fact sound can speak for itself in many ways, and those who practice mantra and OM and the sufi poets may say the true book is sound itself, and the sound is more holy than any book, this echoes in the writing of Panjabi sufi poet Bulleh Shah (1680-1757.)

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[67] Walter. A Jayne, *The Healing Gods of Ancient Civilisations* (New York Hyde Park: New York University Books, 1962).
[68] Frits Staal, *Discovering the Vedas: Origins, Mantras, Rituals, Insights*. New Delhi: Penguin Books, 2008
[69] Finnian Gerety, *Melody, Mantra, and Meaninglessness: Toward a History of OM*, from On meaning and mantras, Essays in Honor of Frits Staal, Edited by George Thompson and Richard K. Payne, (Institute of Budhhist Studies and BDK America inc, 2016.) p186

> You have read a thousand books but have you read your 'self'?[70]

Evidence of Staal's influence can be seen in a book written to honour him, which has thirty-two scholars essays on his work, six of which are written by Indian origin scholars. One of the essays is written by musicologist Finian Gerety, who tackles the subject of OM

> For Hindu traditions, OM is a central and defining mantra that embodies in its single syllable the entire corpus of revealed texts, the Vedas, as well as the transcendent holism that undergirds all reality, brahman. The preeminence of the term OM was established quite early; already in the Upaniṣads OM is central to Brah - manical theology and metaphysics, well on its way to becoming the epitome of mantra, yoga, and meditation in Classical Hinduism[71]

Gerety claims that

> the complete story of OM remains to be written.[72]

Sridhar gives us an insight through his lived approach to OM as he discusses the intuitive origin of *śruti*, and he feels drawn to discuss OM as it's origin, even though this is not written anywhere.

> *Śruti* comes from the basis of OM, and the vedic chanting from Samaveda, the sense of tuning came later on, most of the compositions from the Samaveda came from the heart the head was not involved, when your *bhakti (*devotion*)* is strong things come out[73]

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[70] https://archive.blogs.harvard.edu/sulaymanibnqiddees/2015/11/09/bulleh-shah-if-god-were-found/ accessed November 7, 2024.
[71] Finnian Gerety, *Melody, Mantra, and Meaninglessness: Toward a History of OM*, from On meaning and mantras, Essays in Honor of Frits Staal, Edited by George Thompson and Richard K. Payne, (Institute of Budhhist Studies and BDK America inc, 2016.) p185
[72] Ibid, 185.
[73] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.

Gerety's schorlarly approach, though full of bold claims, can give context to the vedic origins of my research. The work of Staal, Gerety[74] and Wilke[75] offer a modern Western scholarly and respectful perspective into sacred music in South Asia. Nevertheless, I made a clear decision not to draw on their work as inspiration in this project. Instead, I draw on the inspirational musings of Rama, Khan and Frawley, whose words are filled with feeling and spirit, which I see as more appropriate for engaging with the vibrational word and sound knowledge of the vedas in their native Sanskrit. As such this was the direction my work takes as I believe that it can open the door to the seeker of *Anāhata Nāda.*

Alongside this scholarly approach, the work of music cultural historian Richard Williams gives us a useful insight into the convergence of Indian and Western ideas about music, sonic power and the body.

> Precolonial studies of sound acknowledged the idea that musicians could wield miraculous powers through their craft, and musicologists invoked a variety of disciplines and theological worldviews to make sense of where sound came from and how it impacted the embodied self. [76]

An interesting precolonial insight that is in keeping with my approach to the use and power of sound. Williams goes on to ask us to consider other avenues to reveal more about this musical power.

> This diversity can be interrogated further by looking beyond musical scholarship, to consider the place of sound in literature on the medical body. [77]

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[74] Finnian McKean Moore Gerety. *This Whole World Is OM: Song, Soteriology, and the Emergence of the Sacred Syllable*. Harvard University, 2015.
[75] Annette Wilke. "Sonic Consciousness in Hindu India." In *Consciousness Studies in Sciences and Humanities: Eastern and Western Perspectives*, pp. 161-186. Cham: Springer International Publishing, 2024.
[76] Richard David Williams. "Epistemological Jugalbandī: Sound, Science, and the Supernatural in Colonial North India." (2024): 140.
[77] Ibid, 141.

In fact Williams compassionately offers us a way forward to reimagine how we inquire and research areas outside of our cultural and/or praxis heritage.

> Europe's explicit conversation-partners were only one element in the larger landscape of nineteenth-century reflections, and by concentrating too narrowly on Anglophone voices we risk closing our ears to the textures of music and sound in colonial South Asia[78]

Again Sridhar's lived insights into the power of sound can help us to redress and amalgamate this Anglophone bias

> From Yogic point body is a musical instrument, veena and Saraswati, Brahma created that. The buttocks and the head became the body of the veena, hairs became strings, bangles became frets and the fingers became the pegs.[79]

Inner listening is often accompanied with outer compassion, and a letting go of the ego. Devotion to the form is vital to any discourse on the sacred area of esoteric sound. In 1970, composer and sound healer Frank Perry was the first musician in the West to start playing and collecting sacred Himalayan instruments. It was Perry's primary intention to create musical compositions and sound healing through his virtuosic musical abilities, psychic gifts, and deep knowledge of sacred Eastern philosophy and Christian mysticism,

> My desire was to work all my antique sacred Eastern ritual percussion instruments in a pure and ego-less way[80]

Perry has written books, articles and created extensive recordings that stand as the main source of knowledge regarding Himalayan instruments.[81] Perry's

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[78] Ibid, 151.
[79] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.
[80] Frank Perry, *Himalayan Sound Revelations, Second Edition: The Complete Singing Bowl Book* (UK, Polair Publishing, 2016), 16.
[81] Ibid.

approach to music and sound coupled with his extensive knowledge of improvised and experimental music makes him the archetypal sound healing musician and composer. Perry's musical biography has seen him create sound healing music in concerts, for private clients and in his recorded catalogue. In his work *Lotus*, he adds liner notes hinting at a state we can enter whilst listening to this music:

> The stillness and peace of the painting are represented in the sounds that ring on for so long and their subtle resonances [82]

Perry's insight into how to listen is key to engaging with sound healing music, and with this focussed listening in mind, Perry's catalogue of music enables the listener to enter different body-mind states, where his music enables sound experiences in a deeply profound and transformative way, and Perry's music and written sound insights[83] have been at the heart of the sound research.

With my exposure from a young age to Perry's approach to music and sound healing, it is clear to me that there are inauthentic ways to create well-being music simply to generate commercial value. This commercialisation of sound healing and music for well-being has become somewhat of an epidemic in the 21st century. We often see a sales motive tied to humanity's modern mental health struggles, where the media, educational institutions, funders and retailers devise ways to attract listeners to buy replica New Age instruments and engage in commercially concocted well-being music. On music streaming service Spotify, *Music for Sleep* is one of their main income streams.[84] These modern commercial works are not useful to me in the context of my own work, as they are about the unconscious state of sleeping. The sound worlds that this project is interested in

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[82] Frank Perry, "Nicholas Roerich Painting - Lotus," *YouTube*, December 16, 2010, accessed August 14, 2023, https://youtu.be/0en96vQ5pd4.
[83] Frank Perry, *Himalayan Sound Revelations, Second Edition: The Complete Singing Bowl Book* (UK, Polair Publishing, 2016).
[84] Elias Leight, "Spotify's King of Sleep Music Outstreams Lady Gaga, Somehow," *rollingstone*, September 14, 2021, accessed August 14, 2023, https://www.rollingstone.com/pro/features/spotify-sleep-music-playlists-lady-gaga-1223911/.

working with require active listening, so the idea of putting people to sleep is not useful to the work: I prefer to wake people up to their inner sound world.

Ideation: *Śruti* as a bridge to a mystic world

Mystical concepts and Eastern ideas authored in a Western academic paper has some potential complexities: By trying to explain some of the subtler concepts around mystical sound it may be that we destroy the feeling intended by our overuse of the written word; essentially these ideas were formulated in the ether and have been shared orally, and given that they have been passed down from generation to generation, there will be additional complexities, and a difference of meaning implied. Sridhar gave me some clear guidance on this

> Study from the head you get knowledge, study from the heart you gain experience, and that is more powerful than intellectual knowledge.[85]

It is not lost on me that ironically I have written a 30,000 word thesis as the commentary part of a practice based composition portfolio. I am aware that some of the words may be misplaced and overexplained, especially for those more inclined to receive oral based knowledge. I would argue that I had to go to lengths to explain ideas that are commonly known in my tradition, but not familiar to Western scholarship, and given that many of the terms do not have a direct translation, I have had to give more detail. This is a paradox for one doing an oral tradition project in a Western academic institution. I also argue that the project needed a wider context to fulfill the brief of a research based project, and so have offered an insight into the worlds of esoteric and vedic knowledge specific to the creative themes of the project. Additionally to counter my own argument in relation to vedic explanations, mistranslation of *Sanskrit* has recently become high on the agenda of modern Hindu scholars, led by author Rajiv Malhotra,[86] trying to reclaim scholarly positions in Western academia in respect

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[85] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.
[86] Rajiv Malhotra, *The Battle for Sanskrit,* (India: Harper Collins Publishers, 2016).

to their colonised heritage. The word *śruti* may in fact fall into the category of what Malhotra calls a 'non-translatable' word. Given these complexities, I have demonstrated how the knowledge of *śruti,* acquired through oral learning and practice-based research, can inform *rāga* inspired composition, and given the differential between oral learning and written scholarship it was an opportunity to grapple with some challenging concepts and try and record them in written form in a way that took me on a long process of learning through research.

To create the CymaPhone tones for the compositions, it was important to research tuning concepts and systems from India and the West. There are connections to be found in the origins of both systems but, at some point, there was a divergence as each artform developed independently: Indian music retained and deeply developed the solo modal melodic line, whilst Western Classical music developed ensemble performance, polyphony and functional harmony.

Delving into the tunings of India, we can uncover an esoteric, intuitive and scientific use of *śruti* when applied to three relevant research areas:

- *Nāda Yoga*,
- *Rāga*
- Indian Classical Music tuning theory

Śruti within ***Nāda Yoga*** can be seen as the bridge between outer and inner sound, where it can lead the *nāda yogi*[87] to the experience of *anāhata nāda* (unstruck sound); a practice which invites the practitioner to listen inwardly to *śruti*, literally meaning what is heard. Sridhar says on *Nāda Yoga:*

> It is a tone used to practice and arise the inner sound to be able to listen to the continuous anahata nada, which is OM which is

[87] One who practices *nāda yoga*.

> going on in the heart. Only yogis can practice these exercises. Develop the ability to hear the unstruck sound that is going on in the body.[88]

In the Zen tradition this question is posed in the Koan 'The sound of one hand',[89] where the San-Zen master Moku Rai asks his student Toyo to show him the sound of one hand clapping.

Rāga music employs a lot of *mīṅḍ* (bending) to traverse from note to note, where the *mīṅḍ* reveals innumerable *śrutis* (microtones) within a scale. Here we find *śruti* being employed intuitively, when this vast array of microtones becomes available to the intrepid solo *rāga* musician, seeking musical expressions based on their perception of *rāga*: When one analyses Indian Classical Music (ICM) recordings,[90] the precision of the *śrutis* appears to not be so precise when it comes to actual use in modern day performance.

ICM tuning theory within current *rāga* performance is a controversial subject and there is no agreed solution, though the 22 *śruti* system is clearly defined using number ratios and *śruti* steps in the *Sangītaratnākara*,[91] and today is found to be used by a select group of ICM artists as a basis to tune fixed-note Indian instruments, including some musicians who play the 22 *śruti* harmonium, *santoor*, *sitār*, *sārangī* and *sarod*. The tuning theory and practice of 22 *śrutis* was laid out clearly in musicologist Bharat Muni's *Nātyaśāstra*[92] (500BC-500AD): By using his *Chatus-sārāna* (four translations) tuning procedure, he describes the steps between preceding notes. There was not a reference to exact pitches, even though according to music theorist Paul Erlich (1972-), there is a direct reference

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[88] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.
[89] Paul Reps, *Zen Flesh, Zen Bones,* (London, UK: Penguin, 1971), 41.
[90] Dwijendra Bijey Biswas, "Introduction," *autrimncpa*, accessed May 21, 2024, https://autrimncpa.wordpress.com/.
[91] Śārṅgadeva, *Sangītaratnākara of Śārṅgadeva, Vol I, treatment of svara,* trans. Dr. R. K Shringy (Delhi, Varanasi, Patna, India: Motilal Banarsidass, 1978), 108-51.
[92] Dinesh S Thakur, "The Notion of Twenty-Two Shrutis: Frequency Ratios in Hindustani Classical Music." *Resonance* 20, no. 6 (2015): 515–31. accessed doi:10.1007/s12045-015-0211-6.

to the ratios 9/8 for 4 *śrutis*, 10/9 for 3 *śrutis* and 16/15 for 2 *śrutis*,[93] which makes mathematical sense, and therefore follows that we can accurately calculate the remaining *śrutis*. It may be this theoretical aspect of tuning that puts off the intuitive *rāga* musician wanting to keep alive the spirit of the music through an oral tradition, though it may be that Bharat Muni was the first to ably document and mathematically prove a solution to suggest to musicians to test his findings, as opposed to saying this is the final say in the matter.

Returning to the more esoteric aspect of *rāga śruti*, we can find that *rāga* has its origins in the worship of the deity through sound: *Sarasvati* is said to have appeared when *Brahma* threw water onto a tree, giving birth to the *vīṇā* -playing goddess of knowledge and music, who gave us joy and the arts through her inward musings on the *Nāda Brahma*, the universal sound:[94] A *śloka* (couplet) from the *Sāmaveda* implies that there are two *vīṇās*, one physical *vīṇā* for the external ears and one bodily *vīṇā* for singing and to aid spiritual transformation,

Daaruvee gaatra vina satve vina ga na jaatishu ।
Saamikee gaatra vina tu srutyai lakshanam ।।

> Meaning, the body known as Gatra *vīṇā* and *vīṇā* made of tree known as Daru *vīṇā* are meant for divine music.[95]

One interpretation of this *śloka* as a practice in *Nāda Yoga,* is that the strings of *Sarasvati*'s *vīṇā* can be metaphysically perceived within us,[96] where the base of the spine and the base of the cranium are the inner *vīṇā's* bridge and nut respectively, and the playing strings the *suṣumṇā*,[97] our central nervous system.

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[93] Paul Erlich, "Tuning, Tonality and Twenty Two Tone Temperament", *Xenharmonikôn* 17, (1998): 17.
[94] *Brahmanda Purana Chapter 43*, c.300 BCE, trans. Dr. T. V. Tagare, (Delhi: Motilal Banarsidass Publishers, 2000).
[95] E Gaayathri, "Vina: its exalted status in Carnatic music - Part 1," *carnatica*, accessed May 21, 2024, http://carnatica.in/sangeet/vina1.htm.
[96] Saraswati Satyananda Swami *Yoga and Kriya*: *A Systematic Course in the Ancient Tantric Techniques:1* (Bihar, India: Yoga Publications Trust; 2nd edition, 30 Jan. 2007).
[97] Richard David Williams, "Playing the Spinal Chord: Tantric Musicology and Bengali Songs in the Nineteenth Century." Journal of Hindu Studies 12, no. 3, (2019): 319-338, 10.

We can guide our inner listening to perceive this inner music, the unstruck sound, which can be manifested into the struck sound, where it becomes *śruti* (that which is heard) and in turn *śruti* becomes the bridge between these two worlds, as within, so without, 'As above so below'[98]. For *rāga* to be fully formed as a modality for creating melody and musical performance as it is today, according to the *Sangītaratnakara,* it went through this evolution from mystic deity to human voice to gut string.[99] As a performing *rāga* musician and *Nāda Yoga* practitioner, I have drawn upon the philosophical concept of *Sarasvati*'s *vīṇā* and other musical myths that the *vedas* offer, as a way in and out of a human metaphysical and corporeal experience.

The *vīṇā*, the foundational Indian music stringed instrument and precursor to the *sitār*, is used by Bharat Muni to show twenty-two divisions of the octave, which is documented in his *Nātyaśāstra* (500BC-500AD). These twenty-two divisions of the octave are shown with a practical demonstration using two *vīṇās* to analyse the scale degrees in *śrutis* (micro divisions)[100] and establishes the *śruti* distance between each pitch[101] of the *grāmas*[102] (modes) of Indian music, in words and not numbers or frequencies. By testing Bharat's experiment, we can attribute the pitch relations through numerical ratios and construct the same proposed system of twenty-two divisions of the octave, and through constructing harmonic relations between the pitches we can lay out a mathematical version of the 22 *śruti* system. It may be that, like the tuning developments in Western tuning, this system of twenty-two pitches aptly served the needs of the musicians at the time. This theory of twenty-two divisions of the octave, is expanded on by the work of French born Indian musicologist Alain Daniélou. Daniélou's findings were based

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[98] Hermes Trismegistus *Emerald Tablet, 200-800 BCE*.
[99] Śārṅgadeva, *Sangītaratnākara of Śārṅgadeva, Vol I, treatment of svara,* trans. Dr. R. K Shringy (Delhi, Varanasi, Patna, India: Motilal Banarsidass, 1978), 108-129.
[100] Dinesh S Thakur, "The Notion of Twenty-Two Shrutis: Frequency Ratios in Hindustani Classical Music." *Resonance* 20, no. 6 (2015): 515–31. accessed doi:10.1007/s12045-015-0211-6.
[101] S. Balachander, "Indian Tuning Systems (3) – Bharat and Sarang Dev's 22 Shrutis," *puretones.sadharani*, accessed 21 May 21, 2024, https://puretones.sadharani.com/learn/tuningsystems-3/.
[102] *Śaḍaj Grāma* and *Madhyama Grāma* are 2 of the 3 Indian music *grāmas*, scales. The *grāmas* are constructed of semitones or tones of differing sizes, either 2, 3 or 4 *śrutis* apart.

on his long and direct immersion and analysis of ICM; his knowledge was highly regarded by senior *rāga* musicians. He gives a useful and respected Western view of *rāga* tunings,[103] and notates more than twenty-two divisions of the octave showing the tuning for the *rāgas* as *śrutis* and *svara, i.e.* mathematical ratios of the precise *śruti* and the emotional expression of each *svara* through the expression of *Navarasa* (nine emotions), the origin of which is documented in the Hindu *vedic* scriptures *Ṛgveda* (1500-1000 BCE), *Yajurveda* (1200-800 BCE) *Sāmaveda* (1200-1000 BCE) *and Atharvaveda (*1200-900 BCE). This distinction between micro-tuning and melody, *śruti* and *svara,* is made in the *Sangītaratnākara* where the *śruti* is an unsounded mathematical point and the *svara* the living sound or tone.[104] In discussing with practicing Indian Classical musicians in a range of contexts, i.e: facebook conversations, in the green room before concerts, whilst observing them tuning their instrument during rehearsals and on performance projects, it became clear that the 22 *śruti* system is mainly seen by practicing Indian Classical musicians as a mechanical and scientific approach to *rāga* tuning. Currently in Hindustani music, it is rarely adhered to, especially with the advent of the Moghul empire's Islamic influence (1600s) and the European's introduction of the harmonium into India (1800s). *Carnatic* and *Dhrupad* musicians, who interestingly never use the harmonium, do generally still adhere to the *śruti* system, and in practice, more than twenty-two divisions of the octave are used, especially with non-fretted instruments and the voice. There is even mention of 72,000 *nādīs,*[105]

> according to *Prashno-panishada* 72,000 *Nādīs* are originated from *Nabhi* (umbilicus) through its *Moolkanda* (main centre) and spread all over the body[106]

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[103] Alain Daniélou, *The Rāgas of Northern Indian Music.* (New Dehli, India: Munshiram Manoharlal Publishers Pvt. Ltd., 2010).
[104] *Śārṅgadeva. Saṅgīta-Ratnākara of Śārṅgadeva: Sanskrit Text and English Translation with Comments and Notes,* (Delhi: Motilal Banarsidass,1978*).*
[105] Literally meaning channel, and is where energy flows in the human body in a pulsating manner.
[106] Sachin G. Khedikar et al, "Critical comparison of Yogic Nadi with Nervous System", *Joinsysmed* 2016, vol 4(2), 108-113, 109.

discoverable in *Nāda Yoga*. Sridhar gives us a direct insight into these innumerable *nādis* and *śrutis* with ideas that go way beyond any regular Indian musicians tuning vocabulary.

> There are as many shrutis as there are fishes in the ocean, stars in the sky, hairs on the head. They have been able to only discover twenty two, but there were more. Have you ever heard of having two or three 'Sa's'. Nobody has mentioned that, only mentioned the komal, tivra, atti, atti, 2,3 sa's and 2,3 pa's are there.[107]

When researching the *śrutis* I spoke to Hindustani classical musicians, where there was a general caution towards any fixed system, instead there was an overall sense that *rāga* tuning for them must be perceived through aural perception and imitation of their *Guru*.[108] Whilst it is a viable approach, to intuit and imitate tunings, it was not useful to the determination of a tuning system for this project, and conversely the argument of formulating a tuning system and declaring to have solved tuning for all *rāgas* is an unhelpful approach too.

For the purposes of this work, I was only concerned with the fixed note 22 *śruti* system, as it was the most useful practical starting point for tuning a piano to *rāga tones*. This table shows the 22 *śrutis* within an octave, where there is a fixed tonic and fixed fifth and two mathematical tuning positions for the other ten chromatic notes of the octave, i.e. r1/r2, R1/R2…

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[107] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.
[108] *Guru* as a noun can mean teacher or master. *Gu* meaning darkness, and *ru* meaning to dispel, so the *guru* is said to enlighten the seeker.

Figure 1 22 śruti tunings[109]

Shruti	Swara	Ratio	Decimal	**Cents**
1	S	0	0	0
2	r1	256/243	1.0535	90
3	r2	16/15	1.0666	111
4	R1	10/9	1.1111	182
5	R2	9/8	1.1250	204
6	g1	32/27	1.1851	294
7	g2	6/5	1.2000	315
8	G1	5/4	1.2500	386
9	G2	81/64	1.2656	408
10	M1	4/3	1.3333	498
11	M2	27/20	1.3500	519
12	m1	45/32	1.4062	590
13	m2	729/512	1.4238	612
14	P	3/2	1.5000	702
15	d1	128/81	1.5802	792
16	d2	8/5	1.6000	813
17	D1	5/3	1.6666	884
18	D2	27/16	1.6875	906
19	n1	16/9	1.7777	996
20	n2	9/5	1.8000	1017
21	N1	15/8	1.8750	1088
22	N2	243/128	1.8984	1110
1	S'	2/1	2.0000	1200

***Śruti* and Western Tuning.** Here is a brief survey of some notable philosophical theories that have inspired the tuning and compositional research and seem to be connected through their shared esoteric sensibilities, and as such are usefully connected to the main tuning concepts under consideration.

To get a clearer insight into the tuning aspect of *śruti* for the adaptation of tuning a piano, it can be helpful to see the connection to Ancient Greek music, as this is the root of Western tuning. Indian music was spiritually connected to the music and sound healing forms that occurred in ancient Greece, where Pythagoras was seen as an initiator into the spiritual dimensions of sound and healing. Pythagoras was the first Western musician to research the mathematics of sound,[110] and his discoveries, proposed by musicologist Ernest G. McClain to be grounded in the knowledge of the *Rig Veda*, are said to have formed the basis for Western music and tuning. Western music is rooted in the modal music of

[109] Dr. Oke, "Topic 35: How to play 22 shrutis on a synthesizer,"*22shruti*, accessed May 21, 2024, https://22shruti.com/research_topic_35.asp.
[110] Ernest G. McClain, *The Myth of Invariance*, (York Beach, Maine: Nicolas-Hays, Inc., 1976), 2-5.

Greece and is based on Plato's understanding of Pythagorean (c.500BCE) tuning, which mainly uses the 3/2 ratio, the interval of a fifth, as a geometric building block to generate an arithmetic scale. Interestingly, Steiner mentions our bodies experienced state in this time, perhaps highlighting this international intuitive musical connection, where the fifth was the main musical expression,

> In the music of the fifths [*Quintenmusik*], a human being felt lifted out of himself...The angel in my being is beginning to play music. The muse in me speaks. "I sing" was not the appropriate expression. It became possible to say this only when the experience of the third emerged, making the whole musical feeling an inward experience; the human being then felt that he himself was singing. In the age when the fifths predominated, it was impossible to color music in a subjective direction.[111]

It was at this time humanity was developing the ideas of human intellect alongside sacred music. Later in the Renaissance period (c.1400-1600) there was the dominance of the minor and major third, where subjective and emotive songs became more commonplace. This allowed for the development of new tuning systems utilising the 5/4 major third and its relational pitches, designed to develop enhanced modal expression and key modulation.

The process of the Enlightenment (1685-1815), with its scientific and secular approach, seems to have eventually destroyed the use of pure intervals in music, which have been slowly eroded from the Western musical mainstream: Western musicians in the Enlightenment devised many conflicting tuning systems, which led to lots of debate and some confusion, and subsequently an eventually agreed upon standardisation of Equal Temperament (ET). It is interesting to note that ET has only been able to be precisely calculated and correctly employed since

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[111] Rudolf Steiner, *The Inner Nature of Music and the Experience of Tone*, (USA: Anthroposophic Press, 1983), 36.

1917.[112] ET is most suitable for music that can modulate to all 12 keys, chromaticism and 12 tone serialism. Some 20th century Western based musicians, like Harry Partch (1901-1974), became disillusioned with the expressional possibilities of ET, and so there began a musical revolution, mainly in America, to rediscover alternative tuning systems based on 5,7,9 and 11-limit tuning.[113] On reading Hermann Helmholtz (1821-94),[114] Partch developed a fourty-three-note scale based on the harmonic series, which he documents in his book *Genesis of a Music*,[115] and argues against the use of 12 tone ET.

This move away from ET continued in 1960s New Age America, as we come across composer La Monte Young (1935-), considered the father of minimalism, and *rāga* vocal student of *Kīranā Gharānā*[116] ICM vocalist Pandit Pran Nath. Some of Young's recordings include solo *tambura*,[117] tuned to the tonic and fifth, including the album *The Tamburas of Pandit Pran Nath* (1999) where the *tamburas* are tuned at *Jora* Sa (Tonic) 120 Hz, Pa (fifth) 90 Hz, *Kuraj* Sa (tonic octave lower) 60 Hz. This recording was key to immersing in the rich experience of acoustic drones, and for inspiring subtle sonic techniques in my compositions. Young's revolutionary composition *The Well Tuned Piano,* uses a JI 7-limit tuning: (Figure 2) Whilst I was inspired by the sonic qualities of the retuned tones and by Young's tuning perspectives in this piece, I decided to bypass the tuning systems for this project, though it serves as a good reference point.

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[112] William Braid White, *Piano tuning and Allied Arts.* (Boston, USA: Turners Supply Company, 1917), 68.
[113] A Just Intonation tuning system is where the ratios are based on numerators and denominators of the products of 1,2,3,5,7,9 and 11.
[114] Hermann Helmholtz, *On the Sensations of Tone as a physiological basis for the theory of music* (New York: Dover Publications, 1954).
[115] Harry Partch, *Genesis of a Music: An account of a Creative Work, Its Roots, And Its Fullfillments* (USA: Da Capo, 1979).
[116] In ICM, different regional and social musical styles evolved, and the word *Gharānā*, *ghar* meaning house, is used to denote this.
[117] The *tamboura/tanpura*, is an acoustic four to six stringed instrument used to accompany the ICM vocalist and provides the tonic in the form of a drone with a myriad of upper harmonics.

Figure 2 The Well Tuned Piano Tuning[118]

In the 1980s we find American composer Terry Riley's The *Harp of New Albion*,[119] where he retunes a Bösendorfer grand piano to 5-limit tuning (Figure 3). He most likely chose these pitches with reference to *rāga* tunings, learned during his intensive study with Pandit Pran Nath. In *The Harp of New Albion*, the notes are tuned to the smallest integer ratios of 5 limit tuning and C♯ is used as the tuning tonic,

[118] Kyle Gann, "La Monte Young's Well Tuned Piano," *kylegann*, accessed March 13, 2024, https://www.kylegann.com/wtp.html.
[119] Terry Riley, *The Harp of New Albion*, Germany: Celestial Harmonies. CEL 18/19, 1986, CD.

> While I was playing the synthesizers, I got together with Krishna Bhatt, who's a sitār master living in Berkeley. Krishna played in C#, so I started redoing all my pieces in C#.[120]

Figure 3 The Harp of New Albion Tuning[121]

Whilst numbers have their own inherent beauty, we must additionally look beyond mathematical tuning theories to observe that Western and Indian tuning systems have an esoteric (unseen) origin. The notes of a scale are believed to have descended from Heaven, or even from the planets of our solar system, as Pythagoras uncovered in his *Music of the Spheres*. *Pita-Guru* (Father-Teacher, the Hindu name for Pythagoras) showed the pitch relationships between the seven Classical planets and the musical geometry of one string, which is aligned to the

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[120] Recorded on Alain Tanner's film *No Man's Land* (Planisphere compact disc PL 1267, 1985).
[121] Joel K. Haack, "The Mathematics of the Just Intonation Used in the Music of Terry Riley." *Bridges: Mathematical Connections in Art, Music, and Science* Bridges Conference Proceedings (1999): 101–110, 107.

concept of *Sarasvati's* two *vīṇās*. Pythagoras draws our attention to our cosmic origin in the celestial sky, whilst *Sarasvati* draws us to our inner cosmos. Rudhyar's writings, inspired by his mystical practice and astrological mastery, also explored the cosmic concept of celestial tone, as musicologist Gregory Reish observes,

> Rudhyar discussed at length the untapped potential of the single note, giving particular emphasis to the *pleroma* of sound, a saturation of the sonic spectrum he defined as "fullness of conjoined tones within certain limits," from which a tiny portion might be carved out in the act of artistic creation.[122]

It is not necessary to research and analyse all the tunings of Western Music, as *In Sympathy* specifically draws upon the tuning systems employed in the *rāga* music of North and South India, *Hindustani* and *Carnatic* music respectively. It draws upon *rāga* tuning,[123] *vedic* research[124] and 20th century composers and compositions where we find the use of alternative tuning systems inspired by these *rāga* tunings. As well as Riley's use of a 5 limit JI in *The Harp of New Albion (1986)*, other composers including James Tenney[125] (1976-78) and most recently Catherine Lamb[126](2017), have employed 5 limit JI in their works. For reference Schweinitz details the tuning ratios and Western notation of 22 *śrutis* in *The Classical Indian Just Intonation Tuning System*.[127]

To further develop the work of *śruti* beyond my findings and use in the compositions there will be a need for more *vedic* practice and *rāga* based learning,

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[122] Reish, Gregory. "Una Nota Sola: Giacinto Scelsi and the Genesis of Music on a Single Note." *Journal of Musicological Research. 25.* 149-189. 10.1080/01411890600613827. (2006), 152.
[123] Bharatiya Vidya Bhavan. *Ahōbala's Saṅgītapārijāta.* (India: Bhavans Book University, 2019), 67-70.
[124] Bharat Muni's Nāṭyaśāstra, 200BCE-200CE, trans. by Gabe Hiemstra, "Natyashastra (English)", *wisdomlib*, accessed June 19, 2024, https://www.wisdomlib.org/hinduism/book/the-natyashastra.
[125] Harmonium#1-#5, 1976-78
[126] Prisma Interius I-VI, 2017
[127] Wolfgang Von Schweinitz, "The Classical Indian Just Intonation Tuning System," *plainsound*, accessed March 13, 2024, https://plainsound.org/pdfs/srutis.pdf .

the timeline of a PhD will not give enough time to fully capture the deepest level of experience and devotion to *śruti.*

> Sivananda taught my grandfather *microprana*, each *nādi* and *cakra* associated with Astrology, and how to identify a persons illness by playing a *rāga* for each organ or *nādi* in the body, and they carry *mantra*, astrology, mathematics, above all the *Bhava*, feeling. So when I spoke to my grand uncle, who was a priest in Tanjore, Siva temple, he spoke about the *śrutis*, he used to sing *Carnatic*, and then when I met Dagar Brothers they said old Carnatic and ancient Hindustani music is the same and so they accepted me immediately because I could identify their *śrutis*. "You tell me how many ga's I am singing in this *rāga*, *malkauns*, *chandrakauns*. How many komal gas in *darbari*, how many tivra mas in *puriya kalyan*." They were fascinated that I had a solid background from Carnatic *śruti* training. *Śrutis* are not different from Carnatic to Hindustani, only difference is in the style.[128]

Imagination: Mystical Composition in the higher realms.

The common thread through my musical life has been an exposure to music that uplifts the soul, and so I have set out a series of influences and connections to understand this approach to composing. This is not a historical context, in fact the commonality spans many timeframes, and reflects a set of musical influences similar in compositional focus; for example, in respect to Debussy, and other French composers including Ravel, Satie and Dukas, I have absorbed their musical practice, where their composed sound world inspired experiments to create some of the compositions. This impressionistic approach to music has been seen through the ages at various times, where there is a philosophical approach

[128] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.

and humanistic need for creating music, especially by those whose music served as a bridge between the Earthly and Heavenly worlds as part of religious worship and sacred rituals. Cyril Scott writes on Debussy that,

> it was his [Debussy's] mission to begin at the first rung of the Devic evolutionary ladder, and echo the music of the gnomes and fairies, the spirits of the water, and the spirits of the clouds.[129]

Rudhyar describes humanity's move away from religious and cultural adherence towards self-discovery and individualisation just as the Westerner was seeking the 'self' through Indian philosophy,

> Why have you come to me in India? What it is essential for you to discover is who you think and feel you are as an I? Such a discovery can be pertinent if the would-be disciple of the Hindu yogi thoroughly understands that he was impelled to go to India by the present state of his culture and the manner in which, consciously or unconsciously, he is reacting to it. And if Sri Ramana's question is addressed to a modernised Hindu devotee it spurs him to return to the ancient Indian realisation of atman, the transcendent Self.[130]

As people moved away from visiting religious institutions and sought an individual inward experience, music developed as a source of inspiration to deepen the spiritual experiences of the individual. My earliest musical experiences came from some of the most influential musicians of this move towards spiritual music in the West, including American modal and free jazz musicians, most notably tenor saxophonist John Coltrane (1926-1967), who created long improvised solos[131] that expressed his spiritual quest and his deep

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[129] Cyril Scott, *Music and Its Secret Influence* (Rochester, Vermont, Toronto, Canada: Inner Traditions, 2013), 124.
[130] Dane Rudhyar, *Culture, Crisis and Creativity* (Wheaton, Illinois, USA: Theosophical Publishing House, 1977), 1.
[131] John Coltrane, *A Love Supreme* Impulse! A-77, 1965, vinyl.

inner connection to the universal whole**.** This inner search is explored in the music of Alan Hovhaness,[132] Perry,[133] George Gurdjieff,[134] Scott[135] and Claude Debussy.[136] The common link between these musicians is that they sought and discovered a spiritual connection through their music, which invariably was developed through an inspiration from Indian and other Eastern music.

I have drawn inspiration from the music of India, and more to the point I am fully immersed in the traditions of Indian music through my intense study with master musicians from India, especially and most recently 14th generation *Yogi* musician and *sarodiya* Pandit K. Sridhar (1948-). I undertook traditional training from 2020-24 with Sridhar who conveyed to me a deep feeling for *rāga* and *śruti*. This training is a major contributing aspect of my *rāga* on saxophone playing for the portfolio of works. Combining my Indian music knowledge and the influence of these composers, the musical works of the portfolios for in this PhD additionally draw on Perry's Symphonic like compositions,[137] Riley's *rāga* inspired piano work[138] and Gurdjieff's sacred ritual music for piano, as they can serve as a guide to bringing Eastern sound concepts into compositional forms.

As a saxophonist and composer, I have been inspired by the tonal approach of Norwegian saxophonist Jan Garbarek (1947-), whose open sound is like that of the mountains of his Norwegian homeland, inspiring him to create music that mirrored the spirit filled mystical places, especially in his album *Rites*.[139] In the 1990s, Garbarek released several recordings where he had recorded his saxophone in a reverberant church.[140] Garbarek believes the space that a saxophone is played in can be likened to the resonating soundboard of a guitar

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[132] Alan Hovhaness, *Symphony no 22 City of Light* opus 236, 1970.
[133] Ovary Lodge, *Ovary Lodge* Frank Perry, Keith Tippett, Julie Tippetts, Harry Miller, Ogun, OG 600, 1976, vinyl.
[134] George Ivanovich Gurdjieff and Thomas De Hartmann, *The Music of Gurdjieff/De Hartmann,* Triangle Records, Triangle 1001, 1985, CD.
[135] Tony Scott, *Music for Zen Meditation*, Verve, 1964, vinyl.
[136] Claude Debussy, *Et la lune descend sur le temple qui fut,* 1901-1905.
[137] rDorje the Daring from *Messenger of Beauty*, Mountain Bell Music, Bell CD 027 2010, CD.
[138] Terry Riley, *The Harp of New Albion*. Celestial Harmonies. CEL 18/19. Germany, 1986, CD.
[139] Jan Garbarek, *Rites,* ECM 1685/1686, 1994, CD.
[140] Ibid.

or piano. Church spaces that reverberate have been created through the science of sacred geometry, a science that relates to whole number patterns found in the tuning relationships of JI and *śruti* tuning ratios. These geometric ratios have long been researched as a means of understanding the natural world from a mathematical and musicological perspective, as can be found in the work of astronomer, mathematician and writer on music, Johannes Kepler (1571-1630) states in his *De Harmonice Mundi*,

> it follows that the Creator, the source of all wisdom, the everlasting approver of order, the eternal and super existent geyser of geometry and harmony, [141]

Within the field of sacred geometry, the reverberant nature of a building is highly considered. The resonant sound design then serves spiritual unfoldment through reverberant devout singing and illuminating orating, assisting the congregation to enter higher realms. Taking advantage of acoustical design, we find artistic approaches focused on engaging listening in an acoustically vibrant space. American flautist and composer Paul Horn's (1930-2014) *Inside,*[142] recorded in the Taj Mahal, Agra, makes use of the 28-second echo inside the marble dome. Inspired by music created in reverberant spaces, and moreover the reverberant spaces themselves, I created a series of works for solo saxophone[143] in a cave in Rydal, England[144]. This set of works was inspired and recorded on the *Yogic* Holy Day of *Gurupūrnimā*: A Day to honour the *Guru*, both inner and outer, on the full moon in the month of Āśāḍh.[145] The reverberant space of a cave opens up the possibility of creating music based upon sacred principles, and encourages my imagination and listening to move into a mystical realm and create music stirred by a higher intention. The musicians and composers that inspire this

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[141] Johannes Kepler, *Harmonies of the World*, trans. Charles Glenn Wallis (Global Grey ebooks, 2019), 63.
[142] Paul Horn, "Inside." Epic BXN 26466, 1968, vinyl.
[143] Jesse Bannister, "Saxophone in a Cave – Jesse Bannister," *YouTube*, July 15, 2011, accessed August 15, 2023, https://youtu.be/UfG0PJtnjR0.
[144] 54.44326710946257, -2.996342994010265
[145] Fourth month of the *Hindu* Calendar.

investigation believe music should reflect the needs of humankind and offer the listener a vehicle to transcend the everyday experience.

Creation: 'In Sympathy' Portfolios

To realise the portfolios**,** I maintained a strong spiritual connection to the research areas discussed above; during the practical process I aligned the creative output with esoteric practices from *Yoga*, the *Cabbalah*, Christian Mysticism, *Sufism* and *Zen Buddhism*. All these traditions hold sound as key to unlocking an inner experience and, in turn, embodied peace. I drew upon the *Yogic* breathwork of *nādīśodhana prānāyāma,*[146] which is designed to control the breathing and balance the two *nādīs,* channels, through *śodhana*, purification. This purification of the *īḍā* and *piṅgalā* (left and right, feminine and masculine, moon and sun) *nādīs* is said to create a clean central nervous system.

> nadi shodana pranayama, alternate nostril breathing, which activates and harmonizes ida and pingala nadis[147]

This symbolism can be seen in the symbol of Hermes Trismegistus' Caduceus, where there are two serpents coiled around a central staff whose crown is decorated with wings. This Caduceus symbol is used to portray the modern medicinal pharmacist.

I referred to the aural and written philosophy of *sufi* mystic and *Sarasvati vīṇā* master Ustad Hazrat Inayat Khan (1882-927),

> Music should be healing. Music should uplift the soul. Music should inspire.[148]

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[146] Svātmārāma, *Haṭha Yoga Pradīpikā,* c1350, trans. Swami Muktibodhananda (Munger, Bihar, India: Yoga Publications Trust, 1998), 166.
[147] Ibid.
[148] Hazrat Inayat Khan, *The Sufi Message of Hazrat Inayat Khan: Sufi Mysticism*, (Library of Alexandria, 1960), 351.

Here Khan gives us a mystical insight from someone who has spent many years practicing and contemplating on Universal Sound.

> What we call music in our everyday language is only a miniature, which our intelligence has grasped from that music or harmony of the whole universe which is working behind everything, and which is the source and origin of nature. It is because of this that the wise of all ages have considered music to be a sacred art. For in music the seer can see the picture of the whole universe; and the wise can interpret the secret and nature of the working of the whole universe in the realm of music.[149]

Khan expresses the true purpose of the breath, seen as the spirit of a human,

> Wind instruments, like the flute and algosa, especially express the heart quality, for they are played with the breath, which is the very life, therefore, they kindled the hearts fire.[150]

Inspired by Khan's insights I applied simple breathing techniques and perceptions to my saxophone playing whilst creating and recording the works.

A year leading up to the PhD (2020) I recorded an album of improvisations[151] inspired by the music of jazz woodwind musician Tony Scott[152] and the words of *Zen Flesh Zen Bones*[153] *by* American poet Paul Reps' (1895-1990): A translation of Zen stories and the Zen book the *Gateless Gate*. Reps' book has been key to bringing Zen practice to the West in modern times. For my album I would take a Koan or lesson from Reps' book, read it and contemplate on the lesson for 3-6 minutes, and then improvise on the saxophone using a *rāga* or fixed mode for 9-12 minutes. This allowed me to develop a connection to spiritual imagination

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[149] —. *Spiritual Dimensions of Pyschology*, (USA: Omega Publications, 1996), 3.
[150] Ibid. 32.
[151] Jesse Bannister, "A Zen Morning," *soundcloud*, May 16, 2020, accessed March 12, 2024, https://soundcloud.com/jessebannister/sets/a-zen-morning.
[152] Tony Scott, *Music for Zen Meditation*, Verve, 1964, vinyl.
[153] Paul Reps, *Zen Flesh, Zen Bones,* (London, UK: Penguin, 1971).

and develop my own approach to sound creation. This research enabled me to develop compositions in this PhD through improvisation approaches, where I would create specific sound pictures that were inspired by Zen Buddhism and other mystical teachings for some of the portfolio of works. I have selected one piece that uses a Zen Koan as inspiration, noted in Chapter 4.

Summary: Music and Mysticism, a holistic practice

I have laid out how well intentioned spiritually conscious ideals, alongside accurate physiological tuning knowledge can combine, to become a foundation for creating music that best serves the human condition. At present, there is an opportunity for musicians to become co-leaders in holistic health through carefully and creatively researched sound experiments, which merge quotidian needs with mystical practice. Musicians, one could argue, have a responsibility to be wise with the sound tools transmuted to them by deities and the music masters who preceded them. Sound healer and composer Halpern takes this a step further and suggests that we can direct this knowledge to assist the health of the listener,

> as we learn more about our body-mind, healing compositions will be composed to strengthen our altered vibratory patterns and bring them back to balance.[154]

This idea of music affecting people goes further than individual health; when we think about the direct influence of music on our societal structures, we have seen a gradual decline in a localised and humanistic approach in favour of a now globalised and commercialised world.

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[154] S. Halpern and L. Savary, *Sound Health: The music and sounds that make us whole.* (San Francisco: Harper & Row, 1985), 104.

> We are fully aware that in stating this we would seem to be lending weight to the prevalent notion that styles of music are merely the outcome and expression of civilisations and national feelings-that is to say, that this civilisation comes first, and its characteristic species of music afterwards. But an examination of history proves the truth to be exactly the reverse: an innovation in musical style has invariably been followed by an innovation in politics and morals. And what is more, as our chapters on Egypt and Greece will show, the decline of music in these two instances was followed by the complete decline of the Egyptian and Grecian civilisations themselves.[155]

Whilst this thesis does not claim to solve the issues highlighted, my aim was to situate a project where time-honoured values of sound health as a sacred tool can be a guiding principle. Composer Randall McClellan's music research points the way in his book on music healing.

> Music is considered a vital source of spiritual transformation, and vibrations are recognised as cosmic manifestations of a spiritual principle.[156]

It is this and other attuned insights that has kept me on a definite musical path in this PhD; a narrow and challenging way, given the distractions of the modern musician, who is caught between demonstrating intellectual prowess, satisfying an audience and earning a living, yet at the same time creating meaningful work.

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[155] Cyril Scott, *Music and Its Secret Influence*, Inner Traditions, (Rochester, Vermont, Toronto, Canada: 2013), 40.
[156] Randall McClellan PhD., *The Healing Forces of Music, History, Theory and Practice* (San Jose, New York, Lincoln, Shanghai: toExcel, 2000), 46.

Chapter 3 Research Design

Primary Research Considerations

To determine the focus for the PhD, I used a research design which involved combining my understanding of Indian music, Western composition and esoteric knowledge. This multi-faceted approach enabled me to determine the stylistic quality of the portfolio of works.

The six main investigations of the research were.

- Piano tunings
- Sympathetic Resonance
- Sacred space and sound
- Sympathetic Resonance generator
- *Rāga* as a compositional form
- Sympathetic Resonance tonal aesthetic

Piano tunings. The piano can be seen as a mechanised harp which has become the guardian of Western harmony and is partly employed as a musical authority in which to frame Western musical theory. For the purposes of *rāga* performance and *rāga* inspired compositions, the piano has several fundamental limitations: It cannot vowel, bend, sing or play long notes, and its melodies lack the nuance of a breathed instrument.

The biggest challenge I had to address, is that the modern piano is tuned to ET, and as such the pitch differences are the same and the harmonic colours are mainly grey,

> differences of pitch will bring about considerable differences in the expressive significance of the mode.[157]

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[157] Alain Daniélou, *Music and the power of Sound: The influence of tuning and interval on Consciousness*. (Rochester, Vermont, USA: Inner traditions International, 1995), 132.

My aim was to breathe new life into this perhaps 'philistine' of instruments,

> A piano is like the Philistine who no longer contains within him the higher human being.[158]

The project's strength is in the tunings being deployed outside of the now standard Equal Temperament (ET) tuning of the modern piano. Whilst I am not opposed to the use of ET in every context, it is important to establish the case for not using ET in this project. Helmholtz himself points out the issue with the beats created from an ET tuned piano that is struck normally,

> Tempered intonation was first and especially developed on the pianoforte…For the piano, circumstances really favour the concealment of the imperfections due to the temperament. The tones of a pianoforte are very loud only at the moment of striking and their loudness rapidly diminishes. This … causes their combinational tones to be audible at the first moment only and hence makes them very difficult to hear beats from that source.[159]

The success of the SR sustained tones lies in the beating (sonic interference): To retain a more conducive beating expression of Just Intonation (JI), I steered away from ET, bearing in mind that JI and *śruti* tunings are naturally embedded in forms of modal music, and to use ET for modal music when there is the option of using the original and authentic modal tuning would be counterintuitive. It is possible that within the complex detail of the beating relationships of modal music we find the core expression, and therefore identity of the living tones, as Rudhyar evokes when he writes,

> a great hieratic brotherhood of tones, each tone an individual being yet all bound in a perfect metallic solidarity, all blending their voices into the great tone-entity, the Nāda, heard when the center

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[158] Rudolf Steiner, *The Inner Nature of Music and the Experience of Tone*, (USA: Anthroposophic Press, 1983), 75.
[159] Hermann Helmholtz, *On the Sensations of Tone* (New York, Dover Publications, 1954), 323.

> is struck. In a single tone you have a complete organic symphony. Such a tone is the beginning and end of music, the seed of all music.[160]

The SR of the tones of the CymaPhone draws heavily on this idea of tone entity, a central sound, and carefully designed beating relationship formed through *śruti* tuning. Through these vibrational relationships a mode can evoke colour and mood, and when tuned correctly the colours and moods are clear and distinct. In ET the colours are often brittle, and due to the repeated tuning ratio in ET the timbres are essentially the same shade. We should bear in mind that most music composed before 1900, was composed to express sonorities appropriate to the instruments available, where the tunings were based on JI ratios: scholar and choral conductor Ross Duffin (1951-) maintains that the range of sonorities has been lost with the advance of ET (2007).[161]

In making a case against ET, I would maybe be writing music as a reaction to this perhaps destructive tuning,

> The music based on the tempered scale must be considered as an imperfect music.[162]

I do not see my work as reactive to some musical wrong, though I am fully aware of the context: I am immersed in non-Western aural traditions and am therefore predisposed to use tunings that are naturally occurring in their original form, and these tunings bring rise to colours and textures that are well suited to the SR of a piano. ET SR has an edgy feel to it, and whilst it is interesting it lacks the more compassionate expressions; it feels a bit like an alerting signal, an alarm almost. It's interesting that in unearthing this SR sound accidentally in 1991 I was using an ET tuned piano, and now I can see the benefits of a more fluid tuning

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[160] Dane Rudhyar, *The Rebirth of Hindu Music.* (New York, USA: Samuel Weiser, 1979), 23-4.
[161] Ross W Duffin, *How equal temperament ruined harmony (and why you should care)* (New York, London: W. W. Norton, 2007).
[162] Alain Daniélou, *Music and the power of Sound: The influence of tuning and interval on Consciousness* (Rochester, Vermont, USA: Inner traditions International, 1995), 132.

system. To give context within the PhD here is a link to an SR piece using ET: 'From one to another'[163] (2014)

Once I had resolved to not use ET, I initially considered both contemporary and historical piano tuning systems including meantone and well-tempered. I was not totally satisfied that any of these tunings could give the best results for the project, they all seemed to be trying to solve issues particular to the Medieval, Baroque and Renaissance period of music, and as such not relatable to my own compositional style. As Danielou observes,

> the Western musical system has emerged from a mixture of various traditions that, because of complete confusion in the theoretical definitions, were brought together in a rather haphazard way.[164]

Having opted to not use these Early Music tunings, I then went on to research 20th century piano tuning systems, especially those used by Partch, Young[165] and Riley,[166] that diverted from these principal piano tuning systems and were based on the harmonic series and Indian music tunings.

I needed to call on both Western Art music and *rāga* tuning to create a unique tuning system suitable for the recorded compositions: Through careful consideration after numerous calculations and experiments tuning an auto harp, and listening to recordings of music using *śruti* tuning, such as the Dhrupad *vīṇā* master Ustad Zia Mohiuddin Dagar[167] and Dhrupad vocalists The Dagar

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[163] Jesse Bannister, "From One to Another," *vimeo*, 2015, accessed June 29, 2024, https://vimeo.com/138688024.
[164] Alain Daniélou, *Music and the power of Sound: The influence of tuning and interval on Consciousness* (Rochester, Vermont, USA: Inner traditions International, 1995), 121.
[165] Kyle Gann, "La Monte Young's Well Tuned Piano," *kylegann*, accessed March 13, 2024, https://www.kylegann.com/wtp.html.
[166] Joel K. Haack, "The Mathematics of the Just Intonation Used in the Music of Terry Riley." *Bridges: Mathematical Connections in Art, Music, and Science* Bridges Conference Proceedings (1999): 101–110, 107.
[167] Ustad Zia Mohiuddin Dagar, *Raga Yaman*, Nimbus 5276 UK, 1991, CD.

Brothers,[168] I decided to work with two *śruti* tuning systems. It was the listening that was key to resolving this issue, as Alain Danielou points out,

> If we expose our ears to ET, we will perhaps hear it as our preferred choice of tuning, as A. Langel says, "The ear became accustomed to the continual approximations of temperament only at the cost of a part of its natural sensitivity".[169]

I was drawn to non-ET tunings as I was exposed to listening to music from childhood outside of the tempered scale: I first heard *śruti* tuning as a child in the 1970's whilst listening to the recorded music collection of my father, which included Indian Classical Music (ICM).[170] This fluid tuning experience was augmented whilst hearing the music of Frank Perry, whose music follows no specific tuning system, and as such perhaps points towards a future sound world, where tuning is based on a deeply focused and felt response to the tonal sounds in and around us, and not mathematics.

As *sarod* maestro Pandit K. Sridhar says,

> there is an art to listening. If you go to a temple in India, you leave your shoes outside the door. Just so, you leave the intellect and ego out of the act of listening. Come with an open heart. If one listens with the attitude of 'I like' or 'I don't like' then one has already slipped out of the experience. You just surrender to the sound.[171]

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[168] Ustad Moinuddin Dagar and Ustad Aminuddin Dagar. *Dagar Brothers*. His Masters Voice EALP 1291. India, CD.
[169] A. Langel, *La Voix, l'orielle et la musique* (Paris: Germer Bailliére 1887), 154, quoted in Alain Daniélou, *Music and the power of Sound: The influence of tuning and interval on Consciousness* (Rochester, Vermont, USA: Inner traditions International, 1995), 132.
[170] Vilayat Khan, Bismillah Khan and Shamta Prasad. *Duets*, His Masters Voice, ALP 2295, 1967, vinyl.
[171] K. Sridhar, "nada-yoga," *sridhar*, accessed March 9, 2024, https://www.sridhar.org/nada-yoga.

To summarise, I balanced tuning theories of Daniélou, Helmholtz, and Indian music scholar Dr Oke[172], with the practicality of retuning a grand piano within its pitch limitations, and the aesthetic of a tonal sound that appealed to my sensibilities and the benefit of the music I intended to create. For the tuning aesthetic, I referred to Steiner,[173] Daniélou[174] [175] and Rudhyar,[176] who all embrace the concept of tone and emotion.

Sympathetic Resonance. The starting point for the SR investigation comes from the SR of the *taraf* of *sarod*, *sitār* and *sārangi*. *Taraf* was added to *tata vadya,* string instruments in Indian music, from the late 1800s,

> in classical music context is more recent: the sitār became equipped with taraf by the end of the 19th century [Junius 1974, p. 20]. The sarod was elaborated during the second half of the 19th century from the rabab, a Pathan instrument (east of Afghanistan-north of Pakistan) also equipped with taraf strings [McNeil 2004, pp. 11-25, 88-96]. The sārangi, historically associated with singing and dancing courtesans, progressively entered the field of classical music during the 20th century [Qureshi 1997].[177]

After detailed experimentation and interviews with Indian string players musicologists Stephanie Weisser and Matthias Demoucron investigated 'What do taraf do?' and 'What is a good taraf contribution?'[178] They uncovered the richness

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[172] Dr. Oke, "Home," *22shruti*, accessed Mar 9, 2024, https://22shruti.com/?swcfpc=1.
[173] Rudolf Steiner, (From lectures in Germany, 1906,1922,1923) *The Inner Nature of Music and the Experience of Tone (*USA: Anthroposophic Press, 1983).
[174] Alain Daniélou, *The Rāgas of Northern Indian Music* (New Dehli, India: Munshiram Manoharlal Publishers Pvt. Ltd., 2010).
[175] —. *Music and the power of Sound: The influence of tuning and interval on Consciousness*. (Rochester, Vermont, USA: Inner traditions International, 1995).
[176] Dane Rudhyar, *The Rebirth of Hindu Music.* (New York, USA: Samuel Weiser, 1979).
[177] Stephanie Weisser, Matthias Demoucron, "Shaping the resonance. Sympathetic strings in Hindustani classical instruments", *Proceedings of Meetings on Acoustics*, May 13, 2012; 15, 2. (1): 035006.
[178] Ibid, 4.

that the *taraf* added, sometimes the nuance of which was different according to each instrument,

> "taraf make the sound rounder" (sarodiya) vs "taraf improve the clarity of the sound" (sarangiya)[179]

Sridhar gives us a beautiful insight into *taraf* as a singer

> The *taraf* raises the *bhava*, the *bhakti*. When you sing and somenone sings along you are the main string and the audience is the *taraf*[180]

I asked him what would you do without the *taraf*

> It's like having a curry, no salt or no sugar. I will still play though.[181]

In general, we can note that the SR of the *taraf* improve the quality of the sound and assist musician and listener to immerse more deeply into *rāga* music, 'taraf make the sound deeper',[182] with this additional sound reinforcement. The *taraf* create an 'extra-vibration'[183] for the string instrument, that is suitably appropriate for playing music with a modal melodic framework. In a similar way the CymaPhone or reverb in a room or hall can add this suitable extra vibration for a saxophone playing *rāga* or modal music.

Sacred Space and sound. My relationship with creating music in reverberant spaces first occurred in 1987 when I went to busk in the South Kensington museums tunnel in London: It seems at the early age of 16 I was drawn to

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[179] Ibid, 5-6.
[180] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.
[181] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.
[182] Stephanie Weisser, Matthias Demoucron, "Shaping the resonance. Sympathetic strings in Hindustani classical instruments", *Proceedings of Meetings on Acoustics*, May 13, 2012; 15, 2. (1): 035006.
[183] Ibid, 6.

challenging the British institution, by creating improvised music underneath the ostentatious institutions built by the British Empire within the 'Albertopolis'.[184]

This handling of a reverberant space was always of interest to me as a saxophonist. I composed a piece in 2013 for eight saxophones, which was recorded in Rydal Cave, Cumbria, originally a slate mine, it was later used for choral recitals, due to its reverberant nature.

After first coming across Rydal Cave, I travelled home to Leeds and composed site-specific music to be recorded in the cave for multitracked saxophone. By coincidence, or maybe intuition, I happened to compose in the key that matched the natural frequencies, room modes, of the cave. My passion for playing in sacred and reverberant spaces continued through the exploration of playing into the inside of a piano to create a unique auditory experience. This experimentation with space became an essential aspect of my research, where the CymaPhone has become a resonant chamber for creating immersive acoustic music, inspired by historic spaces created for sound healing. It is interesting to note that a physical space we enter is clearly perceived through our ears, as the surfaces reflect sounds that continue to vibrate in the space. By turning the piano on its side and engaging the sustain pedal it sits there openly receiving the sounds created in the room and responds with its own version of these offered sounds, thus demonstrating its power by just being there.

Many ancient cultures used specially designed spaces to create acoustics that supported sacred healing tones. Whilst the CymaPhone is not a chapel or sacred site, I have noticed that people perceive it and interact with it, in a reverent way. It stands on its side like an obscure majestic shrine, a 'sound icon'.[185] This was done to get closer access to the strings, Perry suggested this would better excite the metal strings of the piano. I then played into the piano by kneeling or sitting

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[184] 'Albertopolis', coined in the 1850's, is the nickname given to the area centered on Exhibition Road in London, named after Prince Albert, consort of Queen Victoria.
[185] In 1965 *Horațiu Rădulescu*, the Romanian French composer, conceived the idea of turning a piano on its side to play it like a harp and to bow the strings.

on a low stool in a prayer-like position. Somehow this process invoked a prayer-like quality, almost mimicking the turrets of the *Taj Mahal* through a call to prayer, or a call to listen to one's own inner voice; a true spiritual (meaning natural) practice. In the SR recording process, I had to sit very still after generating the SR, so as not to be heard on the recording and this stillness emphasises this prayer-like quality. When we pray, we are asking to be heard by God or a deity. When we meditate, we listen to God or a deity. Interacting with the CymaPhone became a prayer and meditation with and through pure sound,

> In the beginning was the word [the note played], and the word was with God [strings receive the sound] and the word was God [SR tones][186]

A truly mystic offering, revealed to me through my immersion into this sacred sound path.

Sympathetic Resonance generator. I used my alto saxophone, Selmer Mark Vi (1954), as the primary Sympathetic Resonance (SR) generator. Coincidently Helmholtz, who wrote what is now considered the foundational text on the study of physiological acoustics, gives useful advice for the generation of instrumental SR in his book *On The Sensations of Tone.* In Chapter III, Helmholtz details his research of Sympathetic vibration,

> in this experiment the sounding board of the instrument is first struck by the vibrations of the air excited by the human voice…in place of the human voice, we might of course use any other musical instrument. Provided only that it can reduce the tone of the pianoforte strings accurately and sustain it powerfully it will bring the latter into sympathetic vibration.[187]

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[186] John 1:1 (KJV). A biblical verse that I applied to the practice-based research process.
[187] Hermann Helmholtz, *On the Sensations of Tone* (New York, Dover Publications, 1954), 39.

When I play the saxophone appropriately, with the correct pitch and with little fluctuation, it is an ideal instrument to create SR, as it can accurately excite the tone of a piano string through sympathetic vibration. As I have creative control over the saxophone, and can play full *rāgas* in *śruti* tuning, and improvise or play composed ideas from a wide range of musical genres it became the perfect SR exciter. I had to consider the volume of the instrument and my ability to sit still for lengthy periods of time to allow the SR to fade to silence.

***Rāga* as a compositional form.** The compositions that utilise *rāga* concepts are not to be considered authentic *rāga* renderings, though I have used authentic forms of *rāga* to generate the compositional materials. This enabled me to incorporate key aspects of this musical style, which can offer a unique perspective into the sound world of *rāga*. I have utilised elements of *rāga* music such as tuning, modes, form, phrasing, emotional intention through the *Navarasa*,[188] and nature imitation within *rāga* expression. Nature imitation was explored through mimicking animal calls, creating colourful nature imagery through sound, and spiritualising sound through the 5 elements of *agni* (fire), *vāyu* (air), *dharti* (earth), *jala* (water) and *ākāśa* (space) to aid in the creation of my portfolio of works.

In considering how to embed *rāga*s into the compositions, I addressed some questions to investigate how *rāga* functions as an SR compositional tool:

1. Which tunings are being used for each *rāga*?
2. Which *rāgas* lend themselves to this SR treatment?
3. What *rāga* forms lend themselves to the SR compositions?
4. How does *rāga* and *śruti* tuning affect the playing, SR and compositional output?
5. By listening to an SR *rāga* composition do we still experience it as *rāga*?

[188]*Navarasa* are the nine emotions of performance art in India, Bharat Muni noted eight and the ninth was added by latter musicologists.

6. Can *rāga* tunings, phrases and forms be used in tandem with contemporary music devices, forms and compositions?
7. Can modulation within a *rāga* be adopted?

These questions were deeply considered throughout the PhD process. I have documented the main aspects of the *rāga* influences on the investigation and creative output in chapter 4.

Sympathetic Resonance tonal aesthetic. Once in place the CymaPhone inspired research into the creation of enchanting music; music where the listener cannot quite identify where the sound has come from, which in turn can help them to quieten their intellectual mind, allowing them to experience the tones more directly. By taking advantage of this meditative quality and expressing *rāga* forms through the CymaPhone, I sought to compose music where the listener can immerse in the *śruti* tunings of Indian music without a strong sense of a particular cultural context: The intention is that one does not hear *rāga* or the piano, maybe instead only a tonal quality that may be comparable to a sacred singing bowl, gong or cathedral bell.

To ascertain what SR sound was most useful, additional questions regarding the SR investigation had to be addressed. These questions helped to place the investigation into a specific musical context and enabled me to consider the technical limitations of the available materials at the time:

1. How the energy found in one note through SR be further explored?
2. How the energy found in pairs and groups of notes created by and through SR extend this exploration?
3. Can one create a finite or infinite palate of sounds though SR?
4. How does the SR influence the playing that is used to create the SR?
5. How does the differing playing styles and musical dynamics affect both the SR and the process of creating the SR?

6. In the context of instruments that use SR, including *sitār*[189] and hardanger[190] fiddle; can the CymaPhone enhance the technology of instrumental playing?
7. Can the CymaPhone help us to discover new possibilities for musical training and sound exploration to improve tuning, stillness and well-being?

Throughout the entire process of planning, composing, playing, recording, and editing, these important questions were carefully considered. In this commentary, an overview of the SR investigation is provided, highlighting the main aspects and answering these questions through practical means, whilst considering the aesthetic of the music, as the intention was to create compositions that are creative and meaningful.

Summary

Through the Research Design(RD) areas, I was able to determine the aesthetic nature of the music investigation. The RD enabled me to answer the key practical questions related to creating a well-balanced workflow, where the technical aspects of setting up the CymaPhone, alongside questions regarding SR generator, resonant spaces, *śruti*, sympathetic resonance, *rāga*, and compositional approach were clear, and left space for experimentation during the creation of the SR forms.

The RD was also aligned with the Research Framework(RF) (Chapter 1), as I wanted to be able to conduct the research according to the key themes of Intention, Ideation, Imagination and Creation. The RF was my overall state of being, doing and feeling and was used as a flexible creative tool for working through all the aspects of the RD; it is not that the RF maps directly on to the RD, it is more that the RD fitted within the RF.

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[189] The *sitār* is a fretted Indian string instrument that has *taraf* (sympathetic strings) underneath the 2 main playing strings.
[190] The hardanger is a Norwegian folk fiddle with four sympathetic understrings.

The RF aspect of Intention allowed me to consider how to set up the CymaPhone as part of the RD, so that I was freely able to research the SR with the deepest intention available to me.

The RF aspect of Ideation was closely tied to the RD as I was looking for tuning and *rāga* based solutions so I had to make sure the theory and practice of the RD matched the feeling of the RF. So for example in researching the tunings, I had a clear intention of what was I searching for, it was not enough to come up with a set of numbers.

The RF aspects of Imagination through composition was considerd before the RD aspect of creating the actual compositions, and analysing their individual and collective viability as pieces of music. The Imagination aspect had what I would call a dovetailed relationship, as they both relied on each other to go from thought composition to realized pieces, a concept very much used by music creators in general.

The RF aspect of creation was simply that I was aiming to create a body of completed works. The RD was the starting point for the creation aspect as I needed a practical set up that made it viable to create pieces of music.

The RF essentially made sure that the RD provided a holistic approach for me to engage my intuition in all four aspects of the work.

Detailed Methodology

The focus of the investigation was the recorded sound of the CymaPhone. To achieve this, consideration had to be given to various technical, artistic, and practical factors. To ensure the success of the PhD project and overcome potential challenges, the first year was dedicated to establishing a detailed practice-based research methodology. Once its feasibility was confirmed, a concrete plan for executing the project was developed:

I have discussed the following aspects of this process below taking into consideration:

- The pianos
- The recording locations
- The piano tunings
- The sound generators
- The recording setups
- The compositional processes
- The editing processes
- Live performances
- The compiling of the portfolios

The Pianos

Prior to the start of the PhD, I spent nine months researching which piano to acquire for this project. Having played saxophone into a Yamaha C5, C7, Steinway D and Broadwood, I settled on the Boston Grand 163 (BG163). The BG163 served the needs of the first phase of the project, was easy to retune, and the advanced piano technology enabled a clear lower register for a piano less than 6 foot long. In the first year of the PhD, Steven Leeming, head of sales at

Besbrode Pianos, Leeds,[191] assisted my research by turning a piano on its side to test the SR. I tried playing the saxophone in different positions in relation to the piano; front, side and back, and acquired a sense of the SR possibilities. The BG163 was then delivered to my Leeds studio.

BG163 on its side in my Leeds studio. (pictures 3-5)

Picture 3[192]

[191] Besbrode Pianos. Unit A, Holbeck New Mills, Braithwaite St, Holbeck, Leeds LS11 9XE
[192] All pictures taken in my basement recording studio by myself: Flat 1, 48 Headingley Lane, Leeds LS6 2EL. Taken with iPhone 12 mini on December 24th, 2021, 15:10.

Picture 4

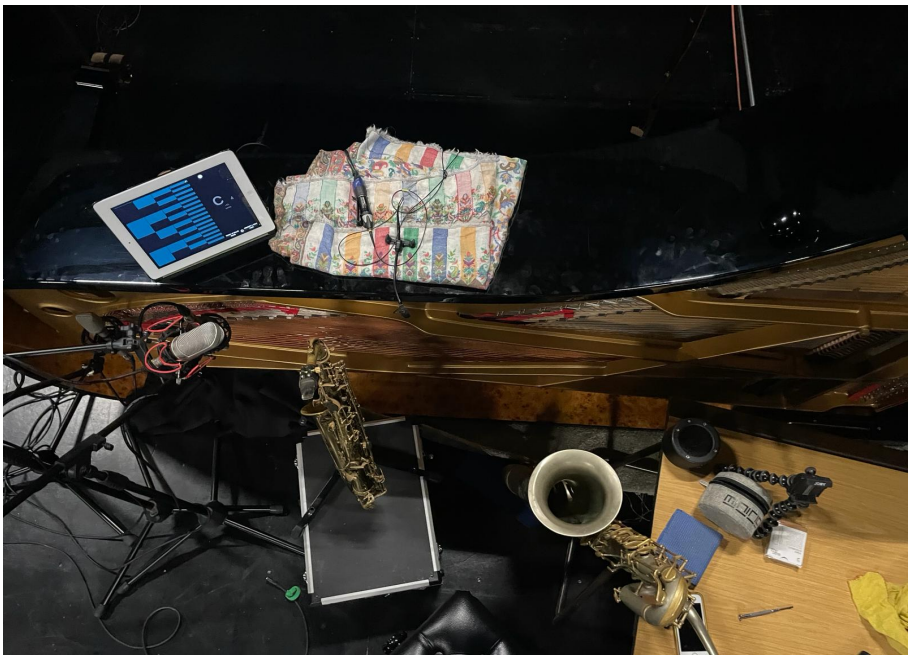
Picture 5

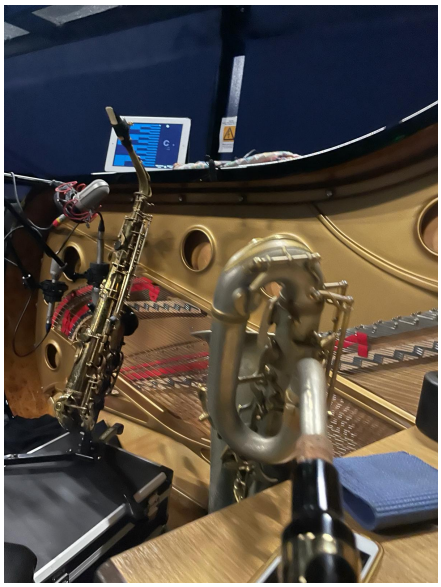
In August of year 1 (2022) I acquired access to a 9’2” long Fazioli F278 (F278), which enabled the investigation to develop.

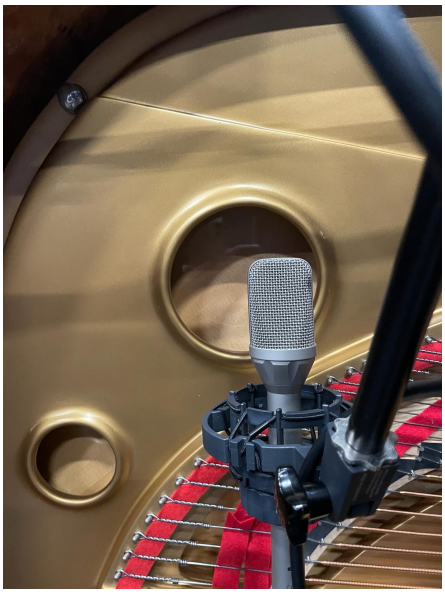
Below are nine images of the F278 taken in the Rymer Auditorium, The University of York in August 2022. (Pictures 6-14)

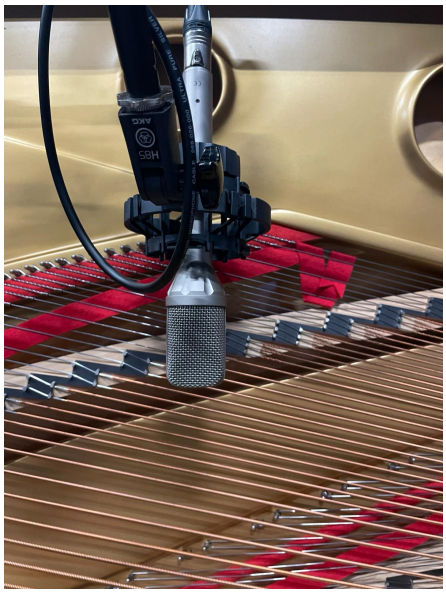
Pictures 6-14[193]

[193] All nine photographs of the F278 were taken by Jesse Bannister August 11, 2022.









There were more surfaces to generate SR from, and more locations for arranging four microphones as two stereo pairs. The long lower range string lengths of the F278 allowed me to maximise the SR from the lower range, and to make the most of this I borrowed a baritone saxophone made by saxophone maker Dave Walker, All Brass and Woodwind.[194] The baritone saxophone's standard sounding range is C2 to A4; an octave and one semitone lower than the alto saxophone. The F278 had a clearer timbre than the BG163, the SR tones were more focused, perhaps due to fewer harmonics, overtones and partials being generated by the saxophone from the F278.

The Recording Locations

The BG163 was recorded in a soundproofed basement studio in an historic building called Ashwood in Headingley, Leeds, which was originally the birthplace and home of Poet Laureate Alfred Austin (1835-1913). The basement studio in Ashwood measured 4mx4m. There was very little reverberation in the

[194] Dave Walker, "Home," *allbrassandwoodwind*, accessed August 22, 2023, https://www.allbrassandwoodwind.webs.com/.

studio, which was ideal for the project, as no saxophone room reverberation was captured by the microphones, allowing clean SR recordings. Having my own studio meant I could record at any time; I often made recorded between 11pm to 4am, when the world around was very peaceful and conducive to the aesthetic of the music being created.

The F278 was in The Rymer Auditorium, part of the Music Research Centre at The University of York, within the Jack Lyons Building in an acoustically soundproofed space with very little room reverberation. The recordings were conducted over a fourteen-day intensive period, where I spent sixteen hours a day creating the SR tones and compositions. It was key to adopt a disciplined body-mind approach to the creation of the works. This included an organic vegetarian diet, alongside preparatory *yoga*, breathwork, prayer and meditation exercises. Abstinence from meat, drugs, pharmaceutical medicine, tobacco, alcohol, caffeine and mainstream media has been a key part of my daily discipline for 30 years, and during the 14-day recording process this was continued to the benefit of the ideals, morals and ethics of the project. Essentially to create well-being music I have prioritized 'being well' in my body-mind, which for me expresses another aspect of Sympathetic Resonance by virtue of positive transmission.

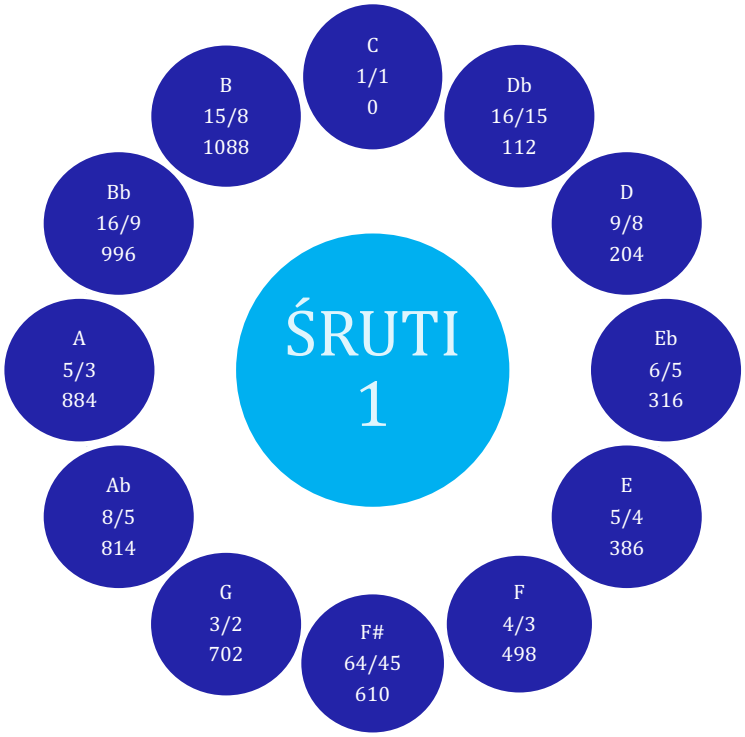
The Piano Tunings

This research was carried out with two applied *śruti* tunings on the BG163 and F278. The musical strengths of a twelve-note piano were retained, which resulted in the compromise of selecting twelve notes from the 22 *śruti* pitches. As an appliable tuning theory, I settled on what I am calling ***śruti 1*** and ***śruti 2*** for all the pieces. All 22 *śrutis* on twelve notes were eventually used in all twelve pitch tonics on my BG163: I was able to tune one of the three strings of each note to the missing *śrutis*. All 22 *śrutis* on the F278 could not be used in all keys, as I did not have permission to tune a $250,000 piano by myself.

In year 1, to get a sense of the note qualities and overtones on the BG163, I spent a week playing and listening to the BG163 note F3. I then trained myself to

retune the BG163 to Just Intonation (JI); It was difficult to deal with the BG163's inharmonicity and stretch tuning, so I collaborated with Leeds piano tuner Bradley Cunningham,[195] guiding him to tune the piano to JI. Initially I showed Cunningham how I tuned one string per note within two middle octaves, F2-F4. I then demonstrated the harmonics of related strings to match JI 5ths and thirds. We used a piano tuning app called iStrobosoft[196] and a tone generator on the app iTabla[197] to check the tunings. It took a lot of discussion and time to tune the whole piano, as it initially resisted this retuning. After three tuning sessions, the BG163 had settled well, and we did not need to retune it for the two years it was being used. For the first stage of testing the SR, the BG163 was tuned to ***Śruti 1***. Shown here are the 5-limit JI ratios from C at 262hz: (Figure 4)

Figure 4 Śruti 1



[195] Bradley Cunningham, "Home," *cpianos*, accessed June 5, 2024, https://cpianos.co.uk/.
[196] Dick Peterson, "istrobosoft," *petersontuners*, accessed September 6, 2023, https://www.petersontuners.com/products/istrobosoft/.
[197] Christophe Baratay, "The Original iTabla," *itabla*, accessed September 6, 2023, https://www.itabla.com/en/iTabla_for_iPhone_and_iPad.html.

This tuning system correlates with twelve notes of the 22 *śruti* system. These twelve notes are the smallest 5 limit ratios and are identical to Riley's tuning in *The Harp of New Albion*:[198] Riley used C# as the tuning tonic in *The Harp of New Albion*. My tuning tonic was C as I play Hindustani Classical music on the saxophone in C, so this tonic was the most useful for me. Additionally, the twelve modes of C had many options for me when playing *rāgas*.

The 22 *śruti* tunings can be seen arithmetically. The building blocks are,

- *Pūrna* (literally meaning *big*) 256/243, 90 cents.
- *Pramāna* (literally meaning *standard*) 81/80, 22 cents.
- *Nyūna* (literally meaning *small*) 25/24, 70 cents.

You can see in the following table how the 22 *śruti* scale can be perceived as twenty-two arithmetic intervals and 1200 cents of these three intervals,

- 7 *Pūrna* intervals.
- 5 *Nyūna* intervals.
- 10 *Pramāna* intervals.

The table has been developed by Dr. Oke, (Figure 5), founder of the research website www.22shruti.com. Whilst it serves a useful purpose and lays out clearly the tunings in *Sangītaratnākara of Śārńgadeva*,[199] there are some debatable ideas in his *rāga śruti* theories.

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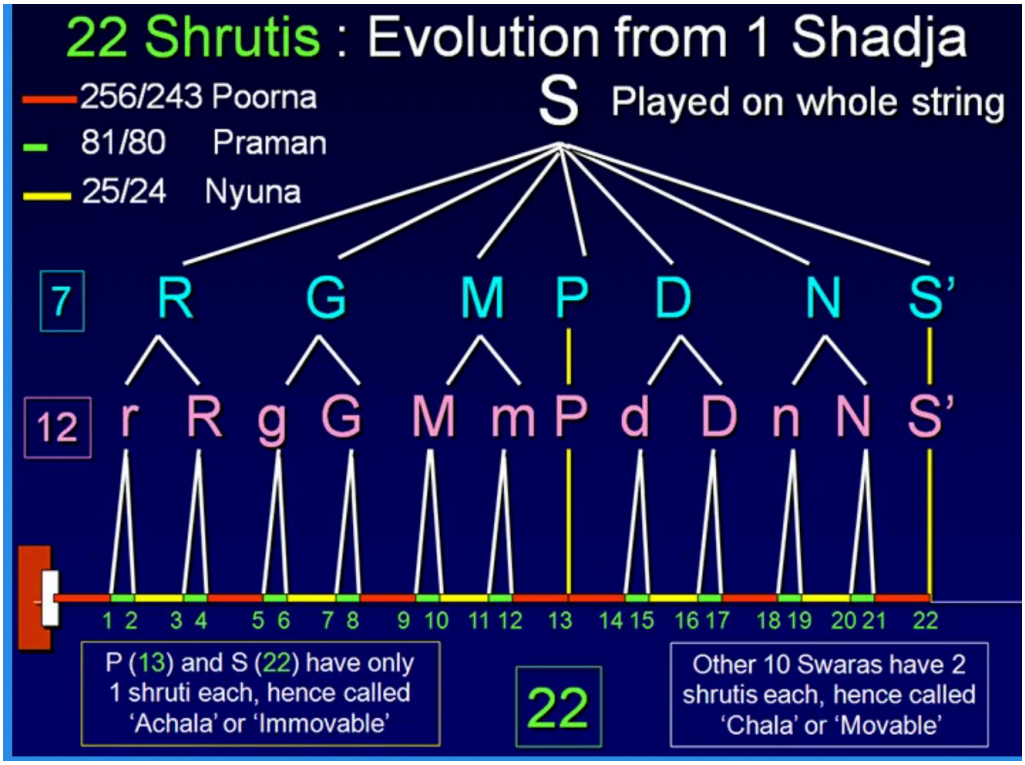
[198] Terry Riley, "*The Harp of New Albion*." Celestial Harmonies. CEL 18/19. Germany, 1986, CD.
[199] Śārńgadeva, *Sangītaratnākara of Śārńgadeva, Vol I, treatment of svara,* trans. Dr. R. K Shringy (Dehli, Varanasi, Patna, India: Motilal Banarsidass, 1978).

Figure 5 22 śruti table from Dr. Oke[200]



To explain 22 *śruti's* from the perspective of Western music we see that in Indian music there are seven main notes, like in Western music. In Indian music Sa and Pa, the tonic and 5th, are *acala*, immovable, leaving five other notes which are *cala*, moveable. These five notes have two positions: natural and flat for Re, Ga, Dha and Ni, 2nd, 3rd, 6th and 7th, or natural and sharp in the case of Ma, the 4th. This then gives us twelve notes, so Indian and Western music shares this similarity.

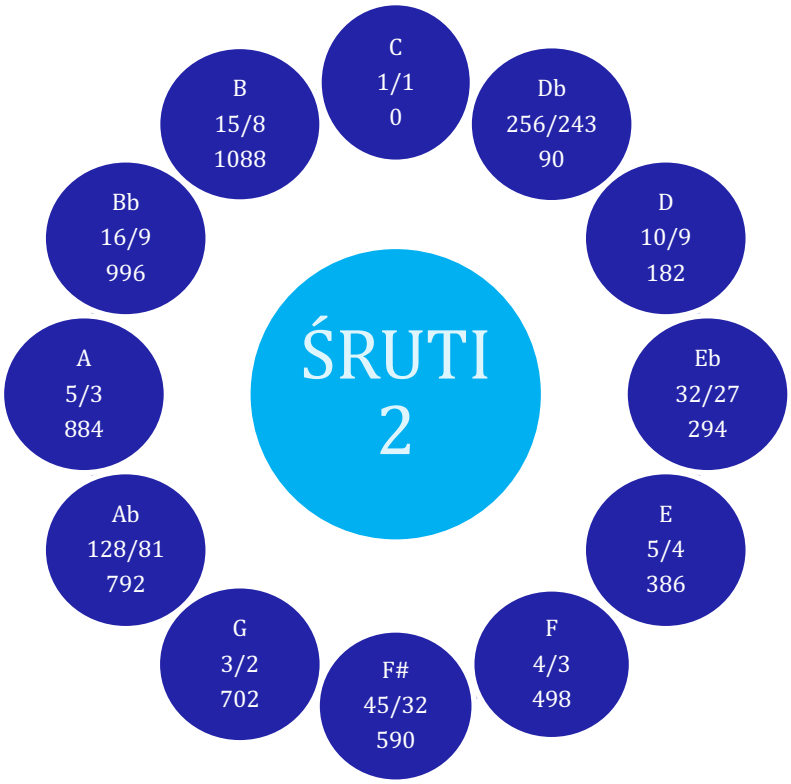
Here is where there is a deviation: The ten notes in the *śruti* system that are *cala*, have two tuning options, giving us twenty-two notes when added to the tonic and 5th. This may have some relation to Western tuning in early music tuning systems; it was acknowledged that there were different tunings for what we now see as enharmonic notes; for example, the A*b* and a G# were tuned according to

[200] Dr. Oke, "Home," *22shruti*, accessed Mar 9, 2024, https://22shruti.com/?swcfpc=1.

their modal reference point and were not seen enharmonically. Zarlino (1517-1590) had devised twenty-four notes in an Octave,[201] which may directly relate to the 22 *śruti* system: In Western tuning the tonic and 5th are moveable, which would give us twenty-four notes per octave. As I used two tunings per piano note on the BG163, I was using twenty-four notes per octave like Zarlino.

For the second stage of testing the SR, the F278 was tuned to ***Śruti 2***. Shown here are the 5-limit JI ratios from C at 263hz (Figure 6)

Figure 6 Śruti 2



The process of discovering and testing ***śruti 2*** required some mathematics: Out of the 22 *śrutis,* I constructed a twelve-note chromatic scale in concert C where tonic and 5th, (C and G) are fixed. I then had to choose the tunings for the ten *cala* notes, (D*b*, D, E*b*, E, F, F#, A*b*, A, B*b* and B). There were two options for each of these ten *cala* notes, which in total gave me one thousand and twenty-four

[201] Goldman, David P. "A New Look at Zarlino's Theory and Its Effect on His Counterpoint Doctrine." Theory and Practice 16 (1991): 163–77. http://www.jstor.org/stable/41054251.

combinations: 2^{10}=1024. That is too many for this project, so it was necessary to crunch the numbers and find the most useful set of twelve notes. If we tune to twelve fixed notes, and discounting the 2/2 octave, we have eleven intervals in all twelve modes: So, we have 132 intervals (11x12). How can we tune using the 22 *śruti* system so that we have the maximum number of usable intervals out of the 132 possible? When I say usable, I am referring to the notes that are usable within the melodic systems of modes and *rāgas*. Intervals of +28 cents etc... are not useful to me at this point as I am researching harmonious scales. In ***śruti* 1**, there are 7 usable major scales and 6 usable minor scales, due to the 5ths or thirds being outside of the harmonious intervals of 3/2 or 5/4 respectively.

I started calculating the tunings where the tuning ratios were as simple as possible:If we map ***śruti* 1** from C to all twelve keys we have 106 usable notes. I constructed the following tables to demonstrate the relationship between the tunings shown here in (Figure 7) for ***śruti 1*** and here (Figure 9) for ***śruti 2.***

Notes on the ***śruti* 1** and ***śruti* 2** interval combinations charts:

- The first line where C is the tonic shows the difference in actual pitch from ET, measured in cents.
- Orange denotes the higher *śruti*
- Blue denotes the lower *śruti.*
- Purple denotes the 3/2 5th.
- White denotes tunings outside of 22 *śrutis:* I argue that these pitches in white are unusable pitches in *rāgas* and Western modal music.
- The following 11 lines; modes from D*b* through to B show the cents difference to ET
- N.B. The pitches coloured orange, blue and purple allow for a ± 2 cent tolerance, a difference I argue is not perceptible to most ears.

Figure 7 Śruti 1 interval frequencies

Śruti 1	Ratio→	16/15	9/8	6/5	5/4	4/3	64/45	3/2	8/5	5/3	16/9	15/8	Usable Intervals			Total ↓	
Sargam→	S	r	R	g	G	m	M	P	d	D	n	N	Higher	Lower	Pa		
C	Cents to ET→	12	4	16	-14	-2	10	2	14	-16	-4	-12	5	5	1	11	
Db		-8	4	-26	-14	-2	-10	2	-28	-16	-24	-12	1	6	1	8	
D		12	-18	-6	6	-2	10	-20	-8	-16	-4	8	4	6	0	10	
Eb		-30	-18	-6	-14	-2	-32	-20	-28	-16	-4	-12	0	7	0	7	
E		12	24	16	28	-2	10	2	14	26	18	30	5	1	1	7	
F		12	4	16	-14	-2	-10	2	14	6	18	-12	6	4	1	11	
F#		-8	4	-26	-14	-22	-10	2	-6	6	-24	-12	2	5	1	8	
G		12	-18	-6	-14	-2	10	2	14	-16	-4	8	4	6	1	11	
Ab		-30	-18	-26	-14	-2	-10	2	-28	-16	-4	-12	0	7	1	8	
A		12	4	16	28	20	32	2	14	26	18	30	6	0	1	7	
Bb		-8	4	16	8	20	-10	2	14	6	18	-12	7	3	1	11	
B		12	24	16	28	-2	10	22	14	26	-4	8	5	2	0	7	
↑ Root													45	52	9	106	← Out of 132

Orange is the Higher śruti.

Blue is the Lower śruti.

Yellow is the usable minor keys

Red is the usable major keys

Orange is the usable minor and major keys

I discovered ***śruti* 2** intuitively whilst seeking a solution to share with tuner Cunningham before tuning the F278 in August 2022. When I first came across the one thousand and twenty-four combinations, I had two days to decide on the tuning. On going to sleep that night, I asked for some divine assistance. On awakening, I remembered mathematician Blaise Pascal's 'Pascal's Triangle' (1654). The theories of the powers of two found in Pascal's Triangle can be found in Indian mathematician Acharya Pingala's *vedic Meru Prastara*[202] (200BCE). *Meru* means mountain, and this translation can help us see that the middle number of each line of the number triangle has the highest value, and the outer edges, left and right, have the lowest value, and therefore the least common solution.

Figure 8 Table of 22 śruti combinations for 12 pitches

Meru	**1**	**10**	**45**	**120**	**210**	**252**	**210**	**120**	**45**	**10**	**1**
Flats	*10*	*9*	*8*	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*
Sharps	0	1	2	3	4	5	6	7	8	9	10

This led me to ***śruti* 2**, where all the *śrutis* from C are flat. This is the last number on the triangle number line and therefore identifies the unique solution. (Figure 8)

With this in place Cunningham retuned the F278. Sa and Pa (Tonic and 5th) are tuned to C and G (3/2) and the ten *cala* notes to the lower *śrutis* from the 22 *śruti* notes. *Śruti* 2 became useful when shifting the tonic: For example, when composing in the mode of D it meant that the relationship to the ten *cala* notes were the opposite to C, as I now had all the higher *śrutis* from the 22 *śruti* notes available to me.

[202] Halayudha, *Chandah Sutra of Pingala Acharya, With the Commentary of Halayudha in Sanskrit*, 900CE, trans. Pandita Visvanatha Sastri, (Calcutta: Ganesha Press, 1874).

I chose to use the lower *śrutis* as I play *rāgas* from C[203] and most *rāgas* use the lower *śrutis.* The way I arrived at this system is recorded below in my diary notes from July 2022.

> Oh, my days, I just had the most incredible Eureka moment. I think I have discovered, uncovered, rediscovered a perfect *śruti* tuning system for any 12-note instrument.[204]

I drew a chart of all ten *cala* notes tuned to the lower *śrutis* and mapped out the chromatic modes of each pitch. (Figure 9) That resulted in 131 usable intervals: I had to avoid the interval G to D, as this was -20, 81/80 (syntonic comma), from a 3/2 pure fifth; an interval known as the grave fifth, 40/27. ***Śruti 2*** additionally works if we tune the ten *cala* notes from C to the higher *śrutis*, and then the interval from F to C becomes unusable as we have a grave fifth again. This aspect of perfect order is seen in the third mode of ***śruti 2***, from D, where all the *śrutis* are higher. I used the colour coding so you can notice that there are lots of repeating patterns in ***śruti 2.*** This in turn highlights the pure and awe-inspiring geometric connection between numbers and musical notes as noted by Kepler.[205]

It is interesting to note that -22 cents is the difference between the *śruti* pairs, and 22 is the number of *śrutis*, and 22 *śrutis* into 7 notes, 22/7, is the most common and simplest integer approximation of π; the key to unlocking calculations of circles.

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[203] I can play *rāgas* from all twelve keys, as I am a musician with a part Western and Jazz background, where my instrument and I have this advantage over Indian instruments. C is my main tonic for *rāga* playing, and in this PhD I played in all twelve keys at some point.
[204] Excerpt from my research journal notes, 2022.
[205] Johannes Kepler, *De Harmonice Mundi, Book V*, (Augsburg, 1619).

Figure 9 Śruti 2 interval frequencies

Śruti 2	Ratio→	256/243	10/9	32/27	5/4	4/3	45/32	3/2	128/81	5/3	16/9	15/8	Usable Intervals			Total ↓
Sargam→	S	R	R	g	G	m	M	P	d	D	n	N	Higher	Lower	Pa	
C	Cents to ET→	-10	-18	-6	-14	-2	-12	2	-8	-16	-4	-12	0	10	1	11
Db		-8	4	-4	8	-2	12	2	-6	6	-2	10	5	5	1	11
D		12	4	16	6	20	10	2	14	6	18	8	10	0	1	11
Eb		-8	4	-6	8	-2	-10	2	-6	6	-4	-12	3	7	1	11
E		12	2	16	6	-2	10	2	14	4	-4	8	8	2	1	11
F		-10	4	-6	-14	-2	-10	2	-8	-16	-4	-12	1	9	1	11
F#		14	4	-4	8	0	12	2	-6	6	-2	10	6	4	1	11
G		-10	-18	-6	-14	-2	-12	-20	-8	-16	-4	-14	0	10	0	10
Ab		-8	4	-4	8	-2	-10	2	-6	4	-4	10	4	6	1	11
A		12	4	16	6	-2	10	2	14	4	18	8	9	1	1	11
Bb		-8	4	-6	-14	-2	-10	2	-8	6	-4	-12	2	8	1	11
B		12	2	-6	6	-2	10	0	14	4	-4	8	7	3	1	11
↑ Root													55	65	11	131

The Sound Generators

As established in the Research Design, the saxophone was the most suitable instrument for generating the piano SR. At first whilst the Boston piano was on its legs, I sat under the piano to hear the SR from the underside of the soundboard. When the notes being played on saxophone were not perfectly in tune with ***śruti 1,*** the SR was not always audible, so this led to a commission with Dave Walker to design and make micro tuning screws (Figure 10) (Figure 11) (Figure 12) on my Alto saxophone to be able to play ***śruti 1*** more precisely. This made it possible for me to generate louder piano SR: On each of the six main keys of the alto saxophone, DEFGAB, Walker created a micro tuning screw. This enables one to minutely raise or lower these six keys, which affects the tuning of the note above: for example, when the D key is lowered, with the D micro-tuning screw, bottom screw in (Figure 12), the E and E*b* when the saxophone is played sounds flatter. With the micro tuning screws, the pitch of the saxophone notes was fixed to the *śruti* tunings required for each separate composition or *rāga*.

Figure 10 *Micro-tuning screws for B and A*

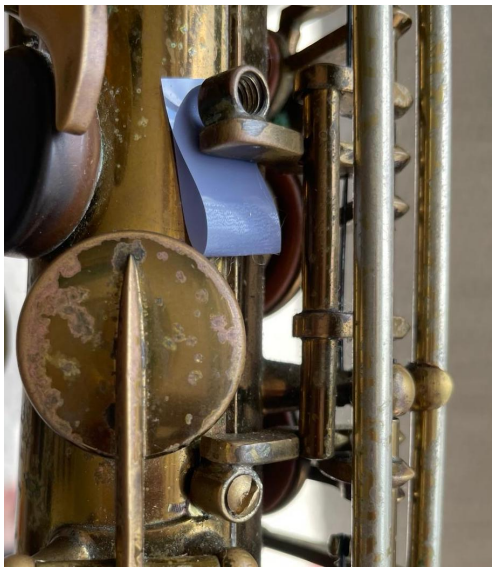


Figure 11 Micro-tuning screw for G

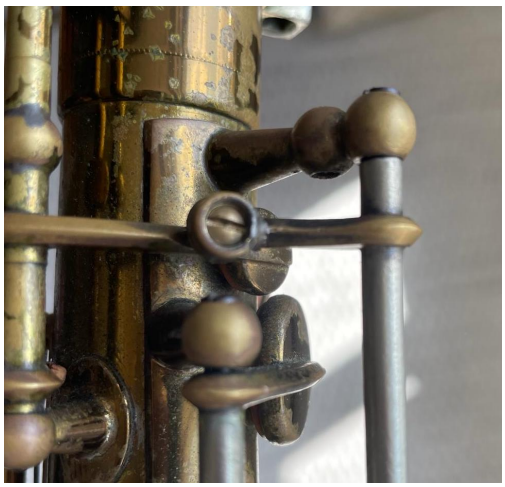
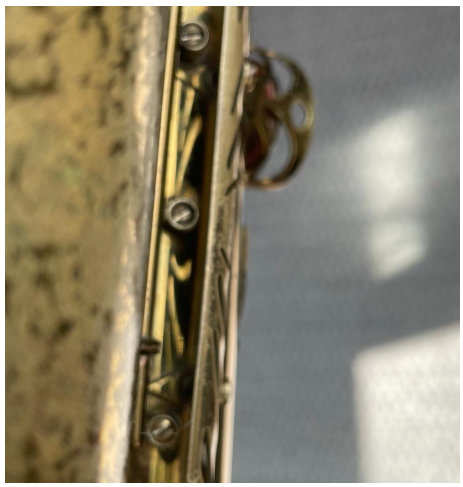


Figure 12 Micro-tuning screws for D, E and F[206]



When recording the SR of the F278 in 2022, I also used voice, flute, baritone saxophone and trombone to generate the SR. The tonal quality of the voice, flute and trombone as SR generators contributed to the project, though the SR with the alto and baritone saxophone was more useful, due to the volume, dynamics, timbre, and pitch range of my approach to playing saxophone. It is reasonable to assume that with more training, another instrument or instrumentalist might be able to achieve similarly meaningful and more varied SR results.

The Recording setups

To ensure a high standard of recording after I used on a matched pair of Microtech Gefell UMT70s (Figure 13). They are clear reference microphones with no tonal colour added to them. They were used as a cardioid pair.

Figure 13 Microtech Gefell UMT70s

Figure 14 UMT70s hpf pad

I used a Grace model 201 (Figure 15) preamp to match the microphone setup.

[206] Figures 12-14 Photographs taken by Jesse Bannister 02 June 2024.

Figure 15 Grace model 201preamp

The microphones and preamp were highly detailed, and the sound to noise ratio was 0db, an ideal audio reference set-up for the recordings. To get the most gain and, in turn, volume for the recordings of the SR, my plan was to have the preamp gain very high: As a result, the high gains caused the recorded saxophone to distort while playing to create the SR, something I had to compensate for in the editing phase of the research.

I tried standard stereo microphone arrangements (XY, AB and mid-side) to discover the ideal microphone placement in order to maximise the volume and clarity of the SR recordings. After experimentation and advice from sound engineer Tim Thomas, I simply opted to place the microphones where most SR was emanating from, and then check for any phase cancellation using a phase inversion plugin. There was very little phasing, and the only adjustment made was to engage the hpf pad, (Figure 14) on the Gefells to reduce low-frequency noise.

On the F278 I used an additional stereo pair of condenser microphones, Schoeps cmc6 with MK21 cardioid capsules. These were positioned on what is normally the underside of the piano.

During the recording process, I was relying on listening to the live SR coming directly from the piano: To have a more detailed impression of the live SR, I set up an audio ducking plugin to send the live piano SR to my headphone mix. This meant that during the recording process, I was hearing only the piano's SR, as the ducking removed the distorted saxophone from the headphone mix.

To preserve the music's emotion and sound consistency, I would generally capture the generated SR in a single, uninterrupted take. In the editing process the recorded distortion created by the saxophone was removed to

leave just the piano SR. This was all carried out using the DAW Logic X in the recording and editing phase.

The Compositional Processes

I have detailed the specific compositional devices used within each piece in Chapter 4. However, there are some broader parts of my approach that are outlined here.

Various methods were used in the research process to produce compositional forms that worked as test pieces and final works, serving as both an exploration and realisation of my overall musical vision.

To maintain a connection to the sound healing inspirations of the music and develop musical content, the compositional research on tone was started by immersing in one note: Initially I sat and sang long notes against a *tamboura* drone, then played long notes on the alto saxophone with the *tamboura*, and finally played repeated single notes on a piano that was tuned to Just Intonation (JI). Whilst undertaking this part of the sound research, I would listen carefully to the piano's sound, to discover the tonal colours and possibilities. The idea was to create full tones from these single notes. The notes seemed to grow, and once the notes had developed into tones, I felt the tones as pulsating spheres of sound energy. This method was integral to my approach in generating the SR from the CymaPhone**,** and this allowed me to closely collaborate with the discoveries to craft tones inspired by sound healing music.

I restricted myself to compose using only generated SR. To have an overview of the SR timbres available to me for composing with, I classified the SR forms using graphic score.(Figure 16) To create compositions for the portfolio, I began by devising an idea through artistic, intuitive, or intellectual means. Once the idea was clear, I either memorised it, created a graphic score or made musical notes to guide me during the recording process. (Figure 17)

Figure 16 Graphic Score

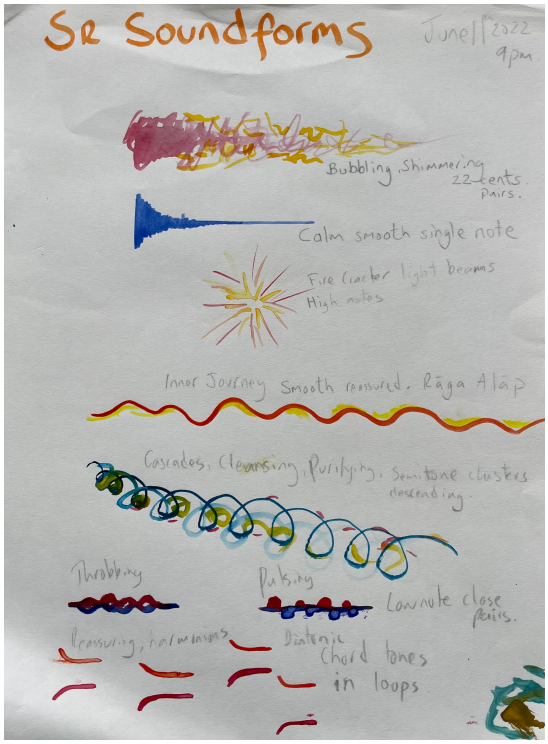
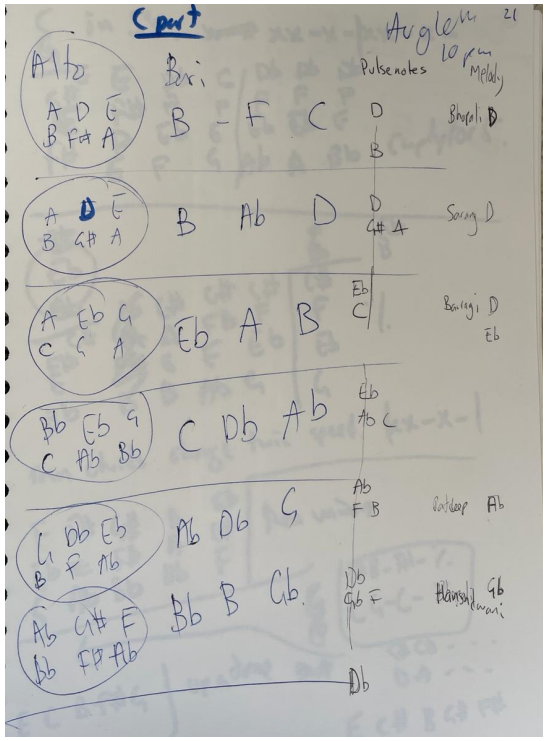


Figure 17 Notes for *18*



The Editing processes

In year 1, immediately after finishing recording each piece, I produced edits to assess how well the pieces would function. After three months of this and composing twenty varied pieces, I deferred the editing part of the process; I had a finite amount of time with the piano, so delaying the editing enabled me to focus on recording the SR. To preserve the compositional ideas, I recorded voice notes to refer to during editing.

The initial editing involved removing the saxophone audio as close to the last played note as possible, leaving just the piano's SR.

(Figure 18) Shows the precut file, where there is audible Saxophone at the beginning creating the SR, and a new saxophone phrase at the end once the SR has died out.

Figure 18 Precut File

Figure 19 Cut File

(Figure 19) Shows the final cut file with fade in and out. There is only audible SR in this file. Then I would arrange the recorded SR audio phrases to match my compositional idea. Audio fades were added, both in and out, to each SR audio phrase. Finally, 4-6 decibels of noise reduction was added using the Izotope RX7 or RX10 plugin (Figure 20) within the DAW Logic pro X.

Figure 20 RX10 Spectral De-noise plugin

There is no equalisation (EQ), or any other effect. The Izotope plugin was used, as the high preamp gain for the microphones was creating noise, especially in the moments when the SR tones faded to silence. Sound loss to the music created by the noise reduction was carefully analysed, and I was satisfied with the outcomes.

Live performances

In Years 2 and 3, the application of the work was tested, through live and immersive films, performances and installations in concert halls, online and in gallery spaces. One of the pieces, composed alongside artist Angela Lyn, from this project appears in the New Age of India Portfolio to give a sense of the collaboration, without distracting too much from the PhD process.

I also furthered the investigation by working with other musicians, instruments and vocalists to generate the SR. I have not included any of these pieces in the final Portfolio selection as these works had a very different character to the rest of the compositions and would have required an additional portfolio, which would have detracted from the main focus of the PhD.

The Compiling of the Portfolios

During the process of research, I realised that the SR possibilities were large enough to submit a full PhD portfolio consisting of only of this type of sound: the results had the potential to be remarkably varied, and to give clarity, the works have been organised in three portfolios, with a fourth created as a combination of these three different artistic approaches.

It was logical for the *Kāranam* Portfolio to begin with some live ICM *rāga* saxophone pieces, without and with SR to give context to the SR works, *śruti* innovations and *rāga* inspired compositional aspects of the work. These pieces stand alone as *rāga ālāpa* improvised compositions.

The Yoga of Sound Portfolio is next and applies the knowledge of *Kāranam*, esoteric knowledge and sound healing music to create a sound healing inspired portfolio of compositions.

The Indian New Age Portfolio completes the three portfolios and is my attempt to take the SR into a more stretched tonal setting, one more conducive to the 21st century contemporary musicians' ears.

I have selected and presented thirty-six pieces from a possible one hundred and forty. The final submission for the PhD only contains compositions created within the timeframe of the research (October 2021-September 2024.)

Methodological Summary

Having researched the context of the project and assessed the research methodology, I was able to begin the central PhD task of creating the portfolio of works. By the end of year 1, I was fully immersed in the exploration and creation of the generated SR tones of the CymaPhone. This investigative process was well supported by the established workflow:

- Composing
- Setting up the CymaPhone
- Recording the saxophone SR
- Editing the recordings.

After three months of initial recording, and an assessment of the project's technicalities in respect to the aesthetic aims, I was well placed to write and record the compositions. I had found a productive way to incorporate my musical skills:

- Composition
- Improvisation
- *Rāga*
- Sound Healing

and the practice-based research themes.

- *Śruti*
- Applied Saxophone techniques
- SR tone generation
- *Nāda Yoga*

The specific compositional methods used for each piece are documented in Chapter 4.

Chapter 4 The Portfolio of Compositions

Portfolio 1 **Kāranam**

1.	Rāga Pūriyā Dhanāśrī	**Indian Classical Saxophone**
2.	Rāga Bāgeśrī	**F278**
3.	The Blessing	**BG163**
4.	Go Forth	**BG163**
5.	Sunrise	**BG163**
6.	Fiery Sky	**BG163**
7.	Crystal Cave	**BG163**
8.	Hand in Hand	**BG163**
9.	Moonlit Blue	**F278**

Portfolio 2 **Yoga of Sound**

1.	The Healing Pool	**F278**
2.	Power	**F278**
3.	The Calm Sky	**F278**
4.	Anāhata Love	**F278**
5.	Surrender	**BG163**
6.	New Dawn through the Mists	**F278**
7.	The Cool Light of the Moon	**F278**
8.	The Rose of Divine Love	**F278**
9.	Sun in Aquarius	**F278**

Portfolio 3 **Indian New Age**

1.	After La Monte	**BG163**
2.	Shivas Light of the Morning	**BG163**
3.	Passage	**BG163**
4.	Choral	**BG163**
5.	Sound piece 1	**BG163**
6.	Sound Piece 2	**BG163**
7.	All is one	**F278**
8.	Sun in Scorpio	**F278**
9.	Sun in Leo	**F278**

Portfolio 4 **In Sympathy**

1.	Harmony Balance	**F278**
2.	Harshal the Awakener	**BG163**
3.	The Still Water	**F278**
4.	22	**BG163/F278**
5.	Illumination	**F278**
6.	Rainbow	**BG163**
7.	Rāga Pūriyā Kalyān	**BG163**
8.	Rāga Hemant	**F278**
9.	18	**F278**

The compositions are presented in four themed portfolios.

1. ***Kāranam*** *(Rāga)*
2. **Sound Yoga** (Sound healing)
3. **Indian New Age** (21st Century)
4. **In Sympathy** (Album)

I have introduced each portfolio and briefly described the pieces. Provided for **In Sympathy** is a more in-depth analyses**,** to give a suitable documentation of my research and compositional process.

As laid out in earlier chapters, a structured research process was followed. The general timeline when investigating the tones of the CymaPhone and forming compositional devices for use in the final pieces included investigating:

- Single notes and drones
- *Rāgas*
- Harmonic shapes
- Chromatic clusters
- Sound textures
- Microtonal Pairs
- Compositional Forms

This investigative process was a way of following an evolved tonal process, mirroring an historic musical progression within an anthropological framework. The research process was distinct, and allowed me to fluidly move between investigating the Sympathetic Resonance (SR) tones and composing, to enable the spontaneous unfolding and documentation of new discoveries.

I started recording single note SR tones generated by alto saxophone and progressed to recording two tone drones of the intervals of a perfect 4th and perfect 5th (4/3 and 3/2). This led me on to record SR generated by playing *rāgas* on alto saxophone, a logical step given the research aims. I spent six months immersed in creating *rāga* based SR, starting with a selection from what are considered, by current performing Indian Classical musicians, as

the main *rāgas* of Indian Classical Music (ICM): this standard repertoire is based on current repertoire heard at concerts and in 21st century audio recordings. I then recorded two hundred and forty *audava* (pentatonic) *rāgas*, and finally a selection of what may be considered rarer *rāgas*, *as in rāgas* that are rarely performed and recorded nowadays. During this *rāga* SR investigation I came across some other non-*rāga* tonal ideas, mainly sound experiments including modal key shifts, symmetrical scales (ie, chromatic, whole tone, diminished scales) and microtonal and atonal investigations. I made a note of them to return to later.

Then I recorded Western melodic ideas, harmonic shapes, chordal progressions, chromatic clusters, and non-specific sound textures. This gave me clear insights into the possibilities for simple ostinatos, drone tones, modal and *rāga* textures, microtonal sounds, and standard Western music harmonic moods and harmonic progressions including musical canons, chord cadences, chordal progressions and Western music modal textures. With these tonal variations at my disposal, I composed and recorded in different ways to create the pieces in Portfolios 2 and 3. I was able to develop longer length pieces where contemporary microtonal devices were used, such as clusters, note bends and chance and atonal note combinations, as well as using standard Western melodic and harmonic ideas to create pieces inspired by sound healing approaches for Portfolio 2.

Whilst creating these recordings I played with the idea of microtonal modulation: having access to framing the music within a *śruti* scale of twenty-two pitches, enabled the creation of subtle microtonal approaches to melodic and harmonic research ideas. As a side note, I was aware that extending the use of *śruti* tuning beyond *rāga* music removed this tuning knowledge from its original intention of *rāga* expression, though it is interesting to note its value as a modal and microtonal composer. I discovered that the *śruti* pairs, where the notes were exactly twenty-two cents apart, 81/80, had a very profound and shimmering sound quality to them. This sound reminded me of the sound of the percussive Tibetan cymblas called ting-sha: These pairs of small, hand held, thick rimmed, metal cymbals are used for…"cleansing our aura…bring us back to the centre (after

meditation)"[207] and other traditional ritualistic sound healing applications. The sound of the ting-sha can be jarring, is high pitched and has a loud attack and lasts around twenty seconds. The correct tuning for a pair of ting-sha when struck together will create a sonic pulsing between them, as they will be tuned slightly out of tune with each other. This acoustic phenomenon is called beating, and can sometimes produce an undertone, where a tone much lower than the individual cymbals can be heard. This tonal phenomenon is referred to as sum and difference,[208] combination or Tartini tones[209] in Western music theory, though I am not sure this is the case with my *śruti* pairs, and I would argue that I have connected them to the sound world of the ritualistic sound healing of Tibet in my compositions, and as such I am not presenting them in this way.

This spurred me on to research all the *śruti* pairs for the full frequency range of baritone saxophone to my altissimo range on alto saxophone, concert C2-C6. I eventually found that the higher frequency pairs created a beautiful sonic friction which sounded like a third tone had appeared, maybe a clue to Rudhyar's Pleroma of sounds,[210] or the Universal world of sound alluded to in the *vedas,* as discussed throughout the commentary. I made use of the *śruti* pairs in various works in all the four portfolios, as it lent itself to different modes of expression. The lower frequency pairs created a less notable yet useful effect; they created low frequency tones that were unstable in character, again a useful sound to create compositions from.

Some of the works served as experiments, where I was not wholly satisfied with the outcomes, so I moved on to other investigations. Some of these experiments included research pieces where I generated SR for the full range of baritone and alto saxophone in the form of SR single notes and created a sample library of these notes to be played on a midi keyboard, enabling me

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[207] Frank Perry, *Himalayan Sound Revelations, Second Edition: The Complete Singing Bowl Book* (UK: Polair Publishing, 2016), chapter 4.
[208] Arthur Taber Jones. The Discovery of Difference Tones. *American Journal of Physics*, (1935). *3*(2), 49–51. https://doi.org/10.1119/1.1992920
[209] Max Meyer, Subjective Tones: Tartini and Beat-Tone Pitches. *The American Journal of Psychology*, *70*(4), (1957) 646–650. https://doi.org/10.2307/1419463
[210] Dane Rudhyar, *The Magic of Tone and the Art of Music* (Boulder and London: Shambala, 1982), 127-155.

to create melodic phrases. This was not very flexible and needs detailed research alongside an electronic music specialist, to create a usable and functional database of SR tones for generic keyboard use, an aspect I decided not to pursue in this PhD.

Towards the end of the year 2 research, I created some harmonic pieces drawing on my jazz harmony knowledge to test the sonic possibilities of modern jazz harmony with SR *śruti* tuning. By year 3, I had moved into the editing, final composition and immersive performance phase, whilst documenting the entire process in the form of this commentary.

I have notated the tunings for the *rāgas* using circles, which echo an astrology chart or *mandala*. These circular forms show the interrelationship between objects, which is a useful way to show the tunings in this project and emphasise that I was exploring what I perceive as tones in motion that pulse from their centre, and may be multi coloured spheres, or pulsating circular forms of light. Essentially the inner imagery is not of this external world, the experience is very mesmeric and allows me to grasp the whole subject intuitively, and so the mandala circles for the tunings were a good way of making this link to what was actually happening during the SR tone creation.

Portfolio 1 **Kāranam**

To give context for the work the first two recordings in this portfolio are saxophone *rāga ālāpas*. These are included here to show the development from traditional ICM saxophone to *rāgas* in SR form: This is key to demonstrate my saxophone playing approach in creating the SR for the whole project.

To give insight into what a *rāga* is Sridhar gives us a poetic perspective

> Raga means attachment. Attachment to the notes with the *bhava* of that *rāga*. Total absorption into the *rāga* with a meditative attitude. Soaking yourself into the ocean of a *rāga*, you go deeper and get attached to it. So attaching the notes to the *bhava* of a *rāga* becomes a raga. Some play with the notes, which is not a *rāga*, other people play with the grammar and shruti of a *rāga*, which is the *rāga*, attachment[211]

When I play ICM in *ālāpa* form I am using the grammar and phraseology of the *rāgas*, which will include concepts such as *graha, (*starting note), *vādī (*King or primary note*), saṁvādī (*Queen or secondary note*)* and *pakaḍ* (key phrase): *Rāga* phrases are played in a systematic way to show the expansion/contraction and development of the *ālāpa,* which include ICM concepts such as melodic range, phrase speed, tonal connection, tonal variation and the expression of each *rāga.* This unfolding occurs with respect to the tuning and ornamentation of each *rāga.*

The second piece, *Rāga Bāgeśrī,* is an ICM *ālāpa* played into the CymaPhone. The phrase lengths and overall playing time is reduced, and there are increased silences between phrases, which allows a shared space between SR and saxophone. There is less *mīṁḍ* (glissando), as it clouds the SR tuning due to the variety of harmonics and partials that *mīṁḍs* activate from the piano strings. These adopted playing techniques have been influenced in the

[211] Pandit K.Sridhar. "Guruji interview." Interview by Jesse Bannister. December 3 2024.

moment by the activated and heard SR in my headphone mix during the recording process.

Pieces 3-9, that have no audible saxophone have been created with virtually no *mīṇḍ*, and bigger silences to allow the SR to completely die out, approximately 30-45 seconds for each note or phrase. These sets of phrases include a limited number of notes, to allow the slow development of the tonal material, as the palate for musical variation and expression using SR is limited compared to a non-SR instrument. I have avoided certain *rāga* ornaments that would give emphasis to an inappropriate note when heard as SR. I have used 'ghost notes' to create subtle SR note volume balances that are heard as subsidiary notes; my intention was for them to be heard as ornaments, where the cyclic waving or musical beating of pairs and groups of notes create subtle phrases in of themselves. It is in fact at this point where the SR becomes co-composer, as the passive strings potential is actively engaged in the will of it's being. This is the motivating part of the music for me, and the core idea transferred throughout the PhD. This adapted approach to playing *rāga* has been necessary to retain the feeling of slow meditative *rāga* music through SR, and I concluded that these *rāga* playing adaptations would allow this part of the work to develop.

Once I noted the passive string had become alive, I listened in detail to its sounding. In the later process of editing this became key to where to place the audio. After I had removed the saxophone phrases in editing (p83), I had to move the cut audio files closer to each other so there was no actual silence. The placement of each cut audio file was an expansion of a musical idea called 'reinforcement'; a principle coined by Frank Perry where a bowl or two bowls create a pulsing, and the striking of a subsequent bowl is determined by the pulsing of the first bowl or bowls.[212] Following this idea I have placed each subsequent phrase according to the pulsing of the previous SR phrase, sometimes in conjunction, opposition, trine, square, anticipated or delayed, working with the astrological notion of aspects. This detail in the editing is barely heard, though it is what gives a gentle flow to the music, an

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[212] Frank Perry, *Himalayan Sound Revelations, Second Edition: The Complete Singing Bowl Book* (UK: Polair Publishing, 2016), 109.

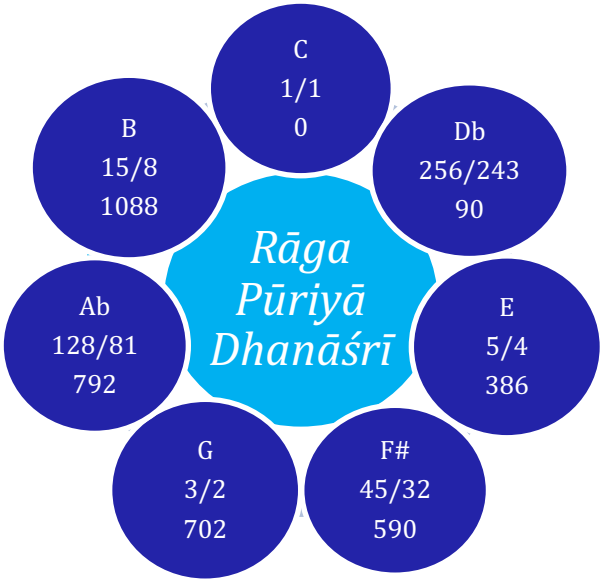
important detail in this context to allow the listener to be at peace during this subtle inner sound journey, one of the key themes of the mystical intention of the works as laid out in Chapters 1-3.

To clarify the tonal material, documented below are the *rāga* names, basic scale form and tunings for each piece. The text on each piece is kept brief to reflect the aural tradition, where there is a brief introduction of what is about to be played and heard.

1 Rāga Pūriyā Dhanāśrī | Saxophone | Alāp in C

An improvisation of an *ālāpa* in *Rāga Pūriyā Dhanāśrī* on alto saxophone. The elements of composition and improvisation are employed in the piece. Compositional form is employed through the structure of the piece; I had a clear sense of the pace, phrasing, focus points and the duration of the piece before I began the recording, as I had practiced these elements beforehand. There is lots of space for improvisation within the piece, where varied phrases, embellishments, repetitions and emotive play are included as ways of bringing the piece to life. Improvisation within a set form and notes is the main element in traditional *rāga* playing.

Śrutis and *svaras* of this *audava- sampūrṇa* (pentatonic-heptatonic) *rāga*.



Ārohaṇa

Ṅ	R̲	G	Ṁ	D̲	N	Ṡ
‘B	Db	E	F#	Ab	B	C′

Avarohana

Ṡ	N	D̲	P	Ṁ	G	R̲	S
C′	B	Ab	G	F#	E	Db	C

The framework for this piece is based on a traditional *Dhrupad alāpa.* There are a set of phrases which show the slow unfoldment of the notes, phrases and stopping notes of the *rāga.* The *rāga* is framed with a return to the tonic, Sa, after the completion of each tonal section. This return to Sa is emphasized with a fixed *mohrā,* which is a pulsed melodic full stop, which acts like a seal. The *alāpa* develops in an upward trajectory, mirroring the *susụmnā* channel where sit the various *nādīs* and *cakras*. The *khayāl* style, [213] literally meaning imagination, of *alāpa* features more ornaments, moves quicker and is designed to entertain the audience. I chose to use a *Dhrupad alāpa* as it is in keeping with the vedic and sound healing nature of the PhD.

I begin improvising around. Sa. I then move to lower Ni and then lower Pa. I then return to Sa.

I rest on Ga for a while and play phrases to establish this tonal centre. I then return to Sa.

I then move to Pa and Ni establishing the middle tonal centre of Pa. I then return to Sa. The climax of the *ālāpa* is the *antarā*, the approach to *tār* Sa (higher octave tonic). I develop phrases to and from *tār* Sa and return slowly to middle Sa via Ni, Pa and Ga.

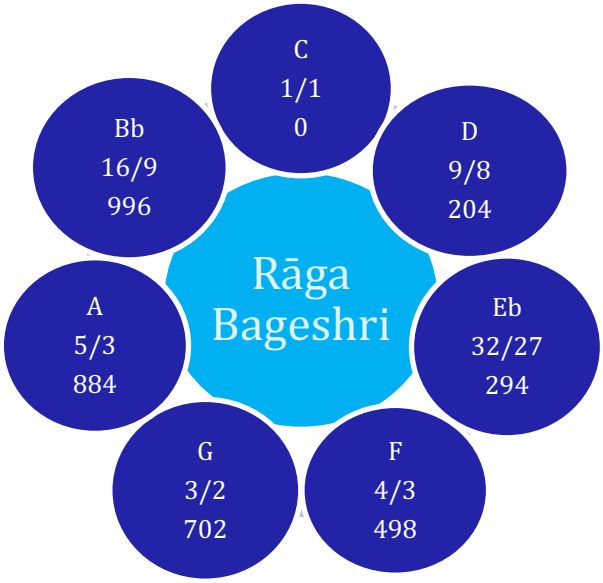
I play the final *mohrā* to complete the *ālāpa*. S – S - , S S - S S - , $^{s}\dot{N}$ $^{s}\dot{N}$ $^{s}\dot{N}$ S - .

[213] The persian influenced ICM style of Classical music.

2 Rāga *Bāgeśrī* Saxophone and SR Ālāpa in C

An improvisation of an *ālāpa* in *rāga Bāgeśrī* on alto saxophone. There is an element of composition and improvisation in the piece, as before I recorded it, I had a clear sense of the pace, phrasing, focus points and the duration of the piece. The difference with the piece Kāranam 1, is that in this piece my response to the SR affects my timing, phrasing, pinpoint tuning and amount of *mīṅḍ*. I have played in the *khayāl* style of *ālāpa* in this piece.

Śrutis and *svaras* of this *audava-sampūrṇa rāga*.



Ārohaṇa

Ṅ	S	G	M	D	N	Ṡ
‘Bb	C	Eb	F	A	Bb	C’

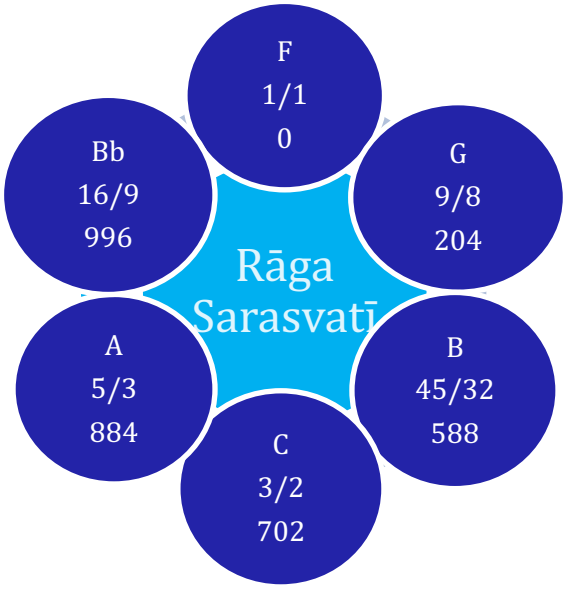
Avarohana

Ṡ	N	D	M,	P	D	M	G	R	S
C’	Bb	A	F,	G	A	F	Eb	D	C

3 The Blessing | Saxophone SR | Alāp in F

The first SR piece is in *rāga Sarasvatī* and is an offering to the *vīṇā* -playing goddess of knowledge and music. In Indian art a *Vandanā* is presented as a blessing to create a sacred space to open the way to the creative imagination through music, dance and poetry. I have played this piece in one take, then compressed time through phrase editing to overlap the phrases with respect to the previously outlined idea of reinforcement.

Śrutis and *svaras* of this *ṣādava* (hexatonic) evening *rāga*.



Ārohaṇa

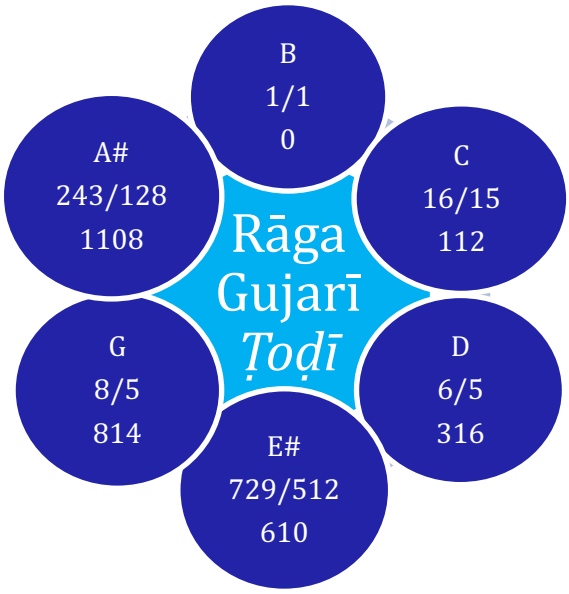
Ṅ	S	R	Ṁ	P	D	N	Ṡ
‘Eb	F	G	B	C	D	Eb	F′

Avarohana

Ṡ	N	D	P	Ṁ	R	S
F′	Eb	D	C	B	G	F

The piece is in *rāga Gujarī Ṭoḍī*. This *rāga* has no Pa and a sharp fourth, which allows the direct approach to Sa, hence the title for the composition. The notes used in this *rāga* are unusual for the Western ear when heard against the tonic drone. This was a good reason to select this piece for the portfolio, as it has an interesting and unique character. The notes can be seen, from a Western perspective, as a bitonal pentatonic scale, where there is a G minor pentatonic superimposed over a drone of B. I played this piece in one take, then compressed time through phrase editing to overlap the phrases.

Śrutis and *svaras* for this *ṣādava* morning *rāga*.



Ārohaṇa

S	R	G	Ṁ	D	N	Ṡ
B	C	D	E#	G	A#	B′

Avarohana

Ṡ	N	D	Ṁ	G	R	S
B′	A#	G	E#	D	C	B

5 Sunrise | Saxophone SR | Alāp in F

This piece is in *Rāga Āhir Bhairav*, constructed of two *rāgas, Āhirī*, the shepherds Song, and *Bhairav*, a *Śiva rāga*. It is not relatable to a standard Western scale. If we perceive the scale as two *angs,* limbs, the *pūrvanga*, lower limb, is in the phyrigian mode[214] with a major third, and the *uttaranga,* the upper limb, is in the mixolydian mode[215] This may be seen as a mixed scale, and there is an aspect of this duality in my approach to the *rāga* in this composition. I have played this in one take, then compressed time through phrase editing to overlap the phrases.

Śrutis and *svaras* for this *sampūrṇa* morning *rāga*.

Ārohaṇa

S	R̲	G	M	P	D	N̲	Ṡ
F	Gb	A	Bb	C	D	Eb	F′

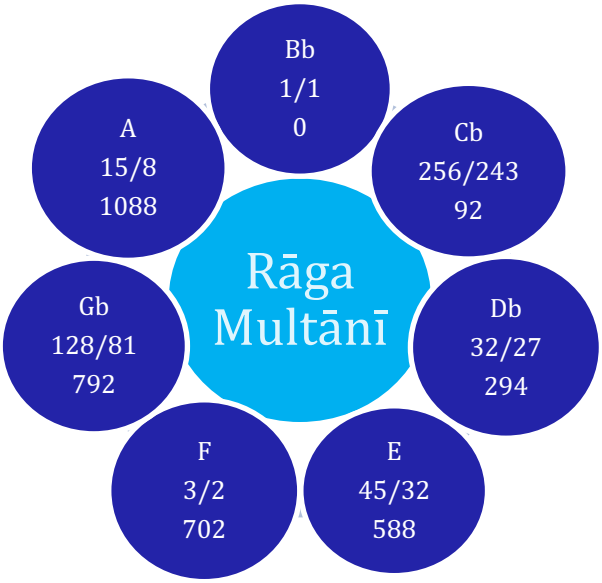
Avarohana

Ṡ	N̲	D	P	M	G	R̲	S
F′	Eb	D	C	Bb	A	Gb	F

[214] This refers to the modern modal term with a major third instead of a minor third.
[215] This refers to the modern modal term.

The piece is in *rāga Multānī*. I have a sense of a golden hot eastern afternoon sky piercing the Earth. This *rāga* uses the same notes as *Ṭoḍī* but due to the phraseology and grammar these two *rāgas* are not related. Whenever I play *Multani* I have always had the feeling of being in the hottest moment of the day. I have taken this idea and shown how the SR echoes this fiery aspect. I played this piece in one take, then compressed time through phrase editing to overlap the phrases.

Śrutis and *svaras* for this *audava- sampūrṇa* afternoon *rāga*.



Ārohaṇa

Ṅ	S	G	Ṁ	P	N	Ṡ
‘A	Bb	Db	E	F	A	Bb’

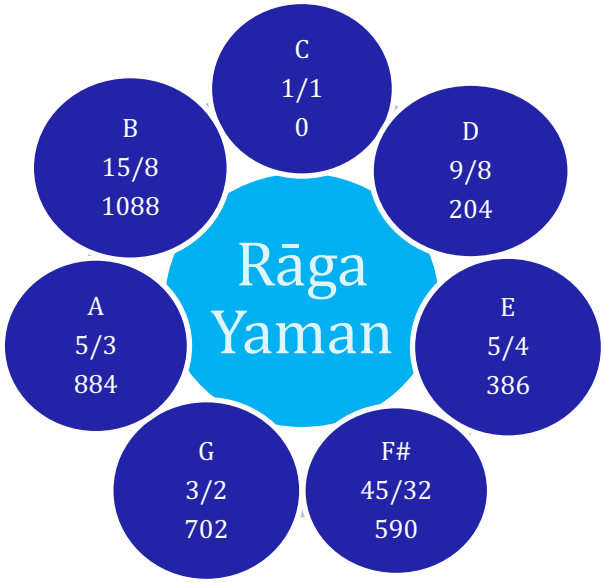
Avarohana

Ṡ	N	D	P	Ṁ	G	R	S
Bb	A	Gb	F	E	Db	Cb	Bb

7 Crystal Cave | Saxophone SR | Alāp in C

The piece is in *rāga Yaman* and is inspired by my sound perception of a mystical painting by Nicholas Roerich, 'Treasure of the Mountain' (Roerich Museum, New York, 1933). I played this piece in one take and compressed time by editing to overlap the phrases.

Śrutis and *svaras* for this *audava- sampūrṇa* evening *rāga*.



Ārohaṇa

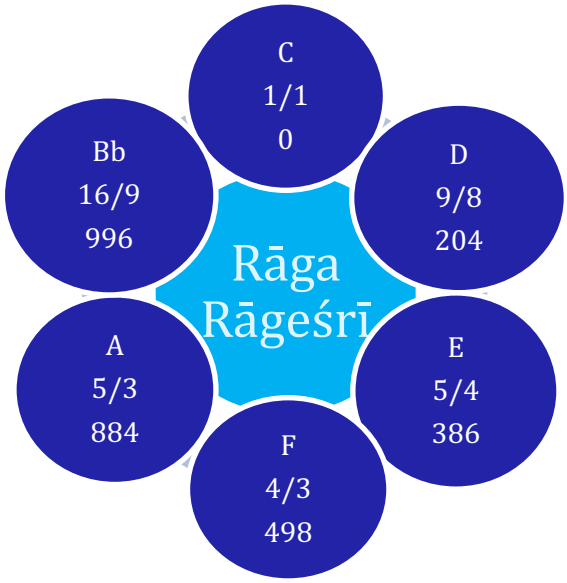
N	R	G	Ṁ	D	N	Ṡ
‘Ḃ	D	E	F#	A	B	C’

Avarohana

Ṡ	N	D	P	Ṁ	G	R	S
C’	B	A	G	F#	E	D	C

The piece is in *rāga Rāgeśrī*. It feels like a comforting walk with a close friend. I selected this *rāga* in the portfolio as it gives a contrast of the use of the secondary tonic. Most *rāgas* are constructed around a strong Sa Pa design. In *Rāgeśrī* we have a *rāga* constructed around a strong Sa Ma design. The lower limb has a phrase that twists, G M R S. The upper limb has a straight descent that avoids Pa. The *rāga* has a sweet and romantic feel, hence the title, and is associated with the *Śṛṅgāraḥ rasa*. I have played this piece in one take, then compressed time through phrase editing to overlap the phrases.

Śrutis and *svaras* for this *audava -ṣādava* evening *rāga*.



Ārohaṇa

Ṅ	S	G	M	D	N	Ṡ
‘Bb	C	E	F	A	Bb	C’

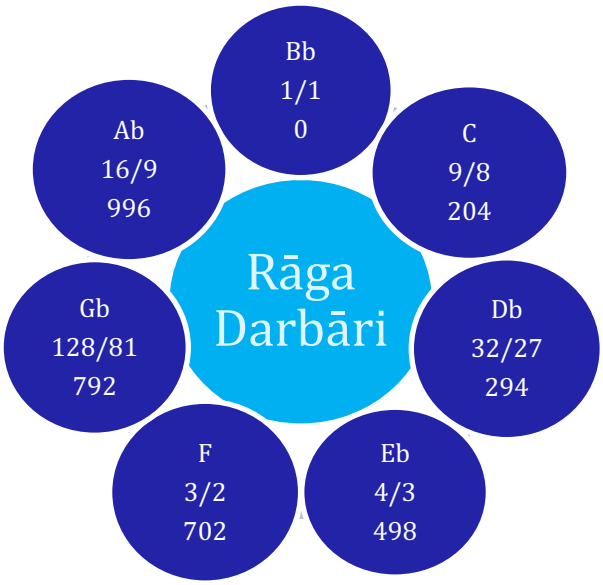
Avarohana

Ṡ	N	D	M,	G	M	R	S
C’	Bb	A	F,	E	F	D	C

9 Moonlit Blue | Saxophone SR | Alāp in Bb

The piece is in *rāga Darbāri*, traditionally played after midnight and is a response to the cool blue light of the moon and can help the listener to have a restful sleep. As *Darbāri* is mainly played in the lower octave I have used the baritone saxophone to generate the low resonance SR. I have included it in the portfolio as it is contrasting to hear a full baritone SR piece. Due to the extra resonance of the lower register, it was hard to control the tonal interactions, so I was careful to play phrases that did not create too much overwhelming SR. I played this piece in one take and compressed time by editing to overlap the phrases.

Śrutis and *svaras* for this *sampūrṇa* evening *rāga*.



Ārohaṇa

S	R	G	M	P	D	N	Ṡ
Bb	C	Db	Eb	F	Gb	Ab	Bb′

Avarohana

Ṡ	N	D	N	P,	M	G	M	R	S
Bb′	Ab	Gb	Ab	F,	Eb	Db	Eb	C	Bb

As discussed throughout the commentary, I had the clear intention of writing Sound Healing inspired music. It may seem misleading to just say the music is inspired by sound healing practices, when it may simply be Sound Healing music. To give context, modern day sound healers are acutely aware of the misuse of destructive tones in the world. These destructive tones can be perceived when considering the world as a 'soundscape,'[216] a term originally coined by environmental planning expert Michael Southworth in 1969. Southworth writes:

> At a time when technological progress is bringing city sounds to the threshold bedlam it is no longer sufficient to design environments that satisfy the eye alone[217]

Composer Murray Schafer popularised the use of 'soundscape' through his work as he saw that:

> Noise pollution is now a world problem. It would seem that the world soundscape has reached an apex of vulgarity in our time and many experts have predicted universal deafness as the ultimate consequence unless the problem can be brought quickly under control[218]

Whilst most musicians may not be aware of the validity of this, I argue that we now need deep consideration and research into this area, so that we can avoid the continued creation of a chaotic sound world that is not conducive to the Earth's and our well-being. Sound is a tool of healing as well as one of destruction through our noisy environments. In fact music therapy and sound healing is a counter to this noise. There are many studies that use music therapy as a tool for wellbeing, and there are now studies within

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[216] Michael Southworth, *The Sonic Environment of Cities*. Environment and Behavior, 1(1), (1969). 49-70. https://doi.org/10.1177/001391656900100104
[217] Ibid, p49.
[218] Murray Schafer, *The soundscape : our sonic environment and the tuning of the world / R. Murray Schafer.* (Destiny Books, 1994).

medical settings demonstrating how music therapy can counter the noise of these environments to produce positive health benefits.

> Ward noise reduction technology combined with music therapy is an effective method to effectively reduce the ward noise and improve the clinical condition of patients.[219]

We need to discern carefully the appropriate use of sound. Altruistic sound research, co-created by spiritual based traditional and authentic sound healing musicians, [220] can assist us to discover and rediscover the need for our connection to sound as a healing agent.

Within sound healing music can support and soothe, as well as challenge or destroy negative thought patterns, or even physical blockages. A true healer will know in which order to start, and how to seal and safely return the client back to themselves. This portfolio draws upon healing devices used by mystics, shamans and healers to frame the musical compositions.

Music for sound healing tends to be durational - extended pieces. I have condensed the lengths of these set of compositions, whilst still importing the essence of appliable sound healing tones created with the CymaPhone. The compositions are not and cannot be specific client-based sound healing music, as it is music created from my knowledge of holistic bodily harmony, spiritual practices and my own at-one-ment as opposed to the specific health needs of a client. The portfolio sits as an interpretation of imaginative sound healing practice-based research.

There were forty pieces, in five themed collections of sound healing works to select from for this portfolio.

- Peace and stillness
- Rainbow Healing (7 colours)

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[219] Zhao, Fengyun, Zhen Sun, and Wenbo Niu. 'Effect of Ward Noise Reduction Technology Combined with Music Therapy on Negative Emotions in Inpatients Undergoing Gastric Cancer Radiotherapy: A Retrospective Study'. *Noise & Health* 25, no. 119 (2023): 257–63. Accessed doi:10.4103/nah.nah_72_23.
[220] see"Home," *nsbtm*, accessed June 16, 2024, https://www.nsbtm.org/.

- Chakra Healing (7 metaphysical centres)
- Prayers
- Zodiac Healing

The portfolio begins with an immersive cleansing piece, *The Healing Pool.* Then there is the strongest of colour pieces, *Violet: Power*. We then gaze upward towards the air spirits with *The Calm Sky*. The *cakra*[221] piece is *The Heart,* the most simple and true centre of our being: The *Sanskrit* translation of the word *Anāhata,* literally means unstruck, which is perceived at the level of the heart *cakra,* and hints at the endless inner silence found in the consciousness of the heart. A prayer is next in the form of joining our Earthly self with our higher heavenly self in *Surrender*. Next a piece to blow away the cobwebs, *New Dawn Through the Mists*. Then a visit to the divine feminine with *The Cool Light of the Moon*. A Mother Earth inspired piece is next with *The Rose of Divine Love*. To finish a zodiac piece as we go to our source and origin, the masculine Sun, with a hint to the present Age we have just begun with *Sun in Aquarius.*

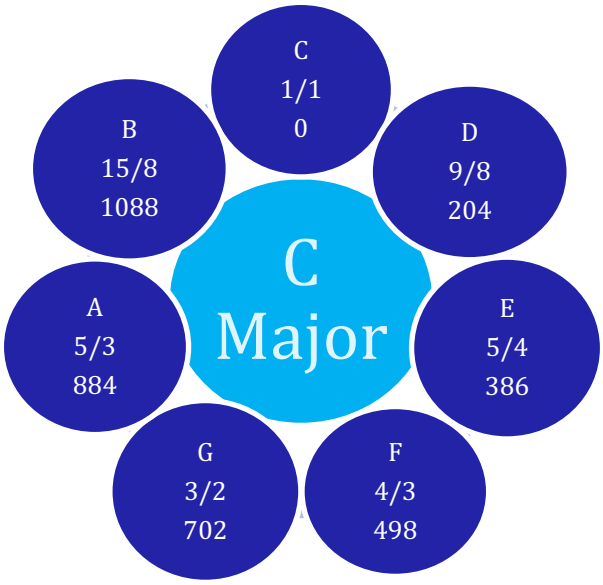
The material in pieces 2,3,7 and 8 was created in as simple way as possible. The complexity is in the setting up of the CymaPhone and preparing myself holistically. These four pieces emphasise the need for humility towards the CymaPhone to allow the instrument to speak for itself, thus revealing something to the listener. Essentially the sound material and the ears response to it is the concept that is being communicated at this point.

[221] Chakra in English and *cakra* in IAST *Sanskrit.*

1 The Healing Pool | SR | Multitrack

This piece is based on a meditation where we can feel immersed in a blue healing pool in a garden with scented flowers and trees. The sun shines on the sparkling pool and you are floating on the water. Then you are lifted to the sunny grass to take time to rest. This healing meditation is one of the ways to heal your etheric body.

The music consists of 3 textures in C major:

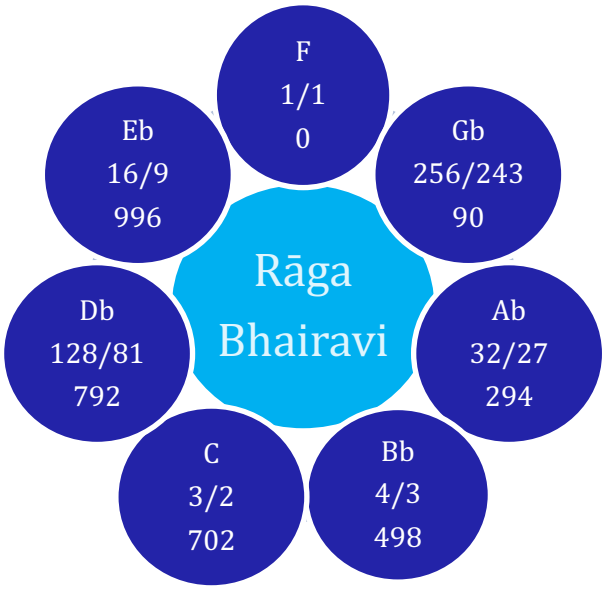


- High notes generated by alto saxophone consisting of notes in the C major scale, which evoke the glistening blue pool.
- Mid-range note pairs generated by alto saxophone using notes E-B, E-G and A-F which imitate the loving atmosphere of the garden.
- Low notes generated by baritone saxophone, C-G, F and C, providing a grounded foundation that imitates the rooted trees in the garden.

The textures have no metronomic pulse, though they are cyclic, and I have allowed them to overlap in an indeterminate way.

This piece is based on the melodic structure of an Andalusian phrygian based mode, and the notes of *rāgas Bhairav*, the masculine form, and *Bhairavī*, the feminine energy. There is strength in the balance between these two strong and opposite forces; form and energy, divine masculine and divine feminine.[222]

Śrutis and *svaras* for this *sampūrṇa* morning *rāga*.

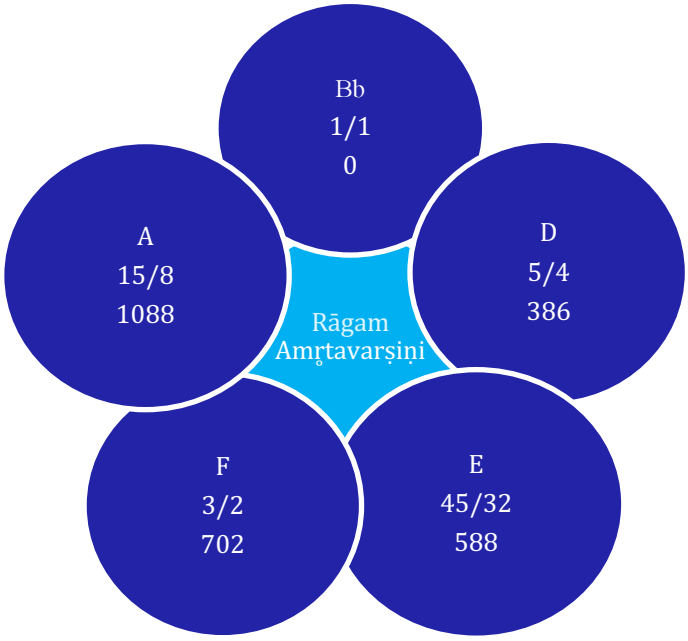


Śrutis for *rāga Bhairavī*. *Bhairav* is the same notes as *Bhairavī* except there is no minor third. *Bhairav* has a natural third, a 5/4 A natural.

[222] Divine Masculine and Feminine are metaphysical concepts used in spiritual traditions and describe the etheric energy inside the physical forms.

3 The Calm Sky | SR | Multitrack

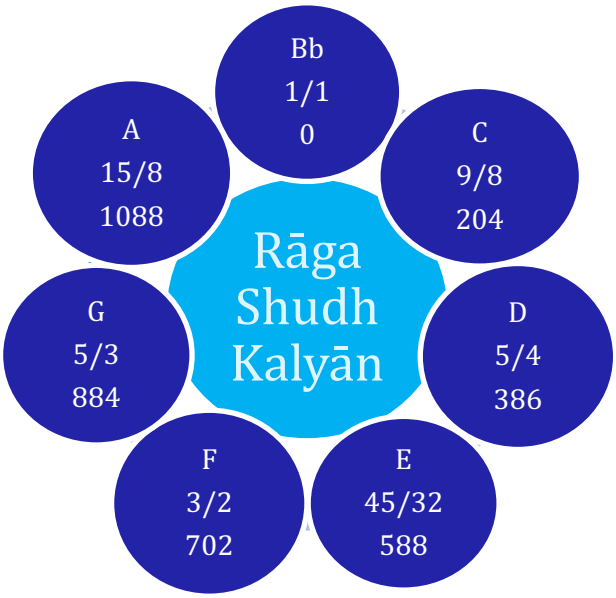
A simple composition that relays the experiencing of the sky capturing the movement and stillness of the air elementals. The Sympathetic Resonance is generated by flute overlaying melodic phrases in Carnatic *rāgam Amṛtavarṣiṇi*: An *audava rāgam* that is a *janya* of the 66th *Melakarta Chitrambari*.



I used this piece in a project at Kirkstall Abbey (April 13, 2024) based around the theme of the Sky.[223] The project was a multi-discipline dance, song and music performance, involving an audience walking around the ruins of Kirkstall Abbey, Leeds. The piece ignites the sky when it was played in the space.

[223] "LLF24 – SongPath Musical Walking Trail," *leedslieder*, accessed July 11, 2024, https://leedslieder.org.uk/whats-on/songpath-musical-walking-trail/.

The tonal material is taken from the scale tones of *rāga Śudh Kalyān* in Bb and is akin to the lydian[224] mode.



This piece is tuned into the consciousness of the heart centre, or *anāhata cakra*. *Anāhata (unstruck)* is an invitation to the loving centre of our being. As Richard Williams highlights,

> Śārṅgadeva elaborated the structure of the cakras and noted that four (anāhata, viśuddhi, lalanā, and sahasrapatra) were crucial for proficiency in music.[225]

As a practicing sound *yogi*, I have used an exercise focusing on four of the twelve petals of *anāhata cakra* to create the sentiments associated with,

> the cultivation of music: The embodied soul established in the (contemplation of) first, eight, eleventh and twelfth

[224] This refers to the modern use of the Lydian mode, a major scale with sharp fourth.
[225] Richard David Williams, "Playing the Spinal Chord: Tantric Musicology and Bengali Songs in the Nineteenth Century." Journal of Hindu Studies 12, no. 3, (2019): 319-338, 13.

petals of the 'cycle of the unmanifest' *anāhata cakra* attains proficiency in music[226]

The four sentiments of the four petals are,

- (1) The destruction of unsteadiness
- (8) Equanimity
- (11) Discernment
- (12) Faith

[226] Śārṅgadeva, *Sangītaratnākara of Śārṅgadeva, Vol I, treatment of svara,* trans. Dr. R. K Shringy (Dehli, Varanasi, Patna, India: Motilal Banarsidass, 1978), 90.

5 Surrender SR Multitrack

This piece is an invitation to surrender our earthly self, our lower mind, to our higher self, our heavenly consciousness where we can meet our perfect self.

The piece is in three sections

- A call to awaken, with bell like resonances amid cyclic note pairs of C-A*b*, E*b*-F and D*b*-G*b*.
- A simple D*b* major note pair sequence B*b*-G*b*, D*b*-F, E*b*-A*b* and C-A*b* arranged in differing orders based on *merukhand* (note permutations*).*[227]
- A saxophone SR drone with voice generated SR that seems to call from a cave.

The piece uses notes from ***śruti* 1** tuning system.

[227] *Merukhand* literally means axis and fragment and has its roots in many spiritual traditions. The ICM origin is taken from Śārṅgadeva, *Sangītaratnākara of Śārṅgadeva, Vol I, treatment of svara,* trans. Dr. R. K Shringy (Dehli, Varanasi, Patna, India: Motilal Banarsidass, 1978).

6 New Dawn Through the Mist | SR | Multitrack

After seeing so many people in cities and towns who are surrounded by a heavy psychological fog, I composed a sound piece to mirror the journey out of this fog. The piece is in two sections. The note names are not significant as I have played intuitively with sound.

- I have created dense chords by playing random phrases and then I let them decrease in volume and then play a new and more focused phrase over the top, so there seems to be a piercing tonal cluster coming out of a mist of sound.
- I have used baritone and alto saxophone to give an impression of musical surety, where big diatonic chord like gestures emphasise strength; I repeat this sequence to underline this feeling.

The piece uses notes from ***śruti* 1** tuning system.

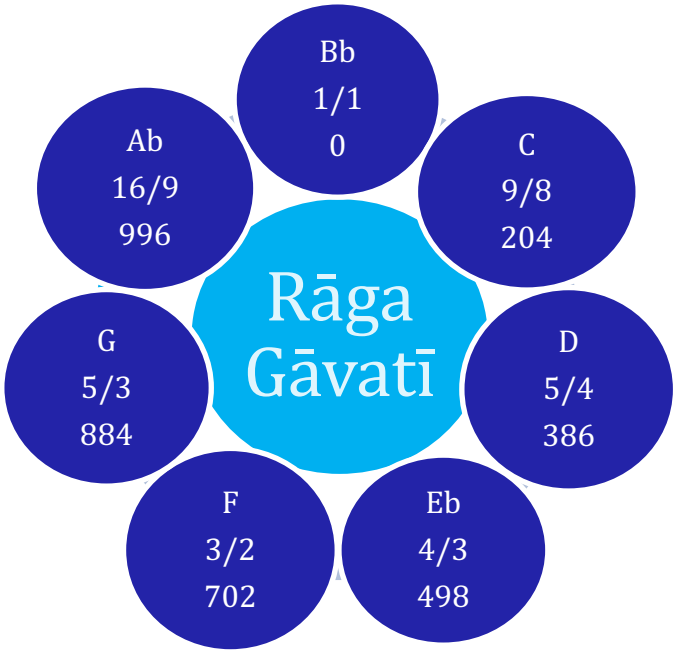
7 The Cool light of the Moon | SR | Multitrack

The piece has an ambiguity to it, as the key centre is not defined and mirrors the transient nature of the moon. This piece was selected as I wanted to demonstrate a way of playing with little thought, to see how it turned out. The piece was recorded at nighttime when the moon was visible, which was approaching its full moon phase. The piece was created in a semi-tired intuitive state, and it was interesting to make a piece without a plan where I was able to casually play a random sequence of diatonic notes. I discovered that it was important to create pieces that stepped away from the main SR investigation, as it allowed the creation of the works to flow and allow new ideas to come through, and this piece was one of many intuitive sketches that assisted the overall process.

The piece uses diatonic notes from ***śruti* 2** tuning system.

8 The Rose of Divine Love | SR | Multitrack

The piece uses notes from ***śruti* 2** tuning system in evening *rāga Gāvatī* in B*b*.



This piece is inspired by the fragrance of the Rose and all it has to offer as inspiration to our loving, lovable and loved self. When smelling a rose, I am taken to a place of warm inner peace, and this composition reflects this inner state. During 2020 I discovered an ability to relate *rāgas* to local Yorkshire nature and the English seasons. Whilst playing *Gāvatī* I had the direct impression of a summer rose, with the warm summer evening warming the petals of a rose as the aroma filled the space around itself. *Gāvatī*, sometimes called *Bhīm*, has an interesting twisty descent on both upper and lower scale limbs. This highlights the Sa Dha Ma, relationship, and contrasts with the ascent which highlights the Sa Ga Pa Ni relationship. From a Western perspective we may observe that the *rāga* movement makes use of two chords, B*b*7 and E*b*6.

9 Sun in Aquarius | SR | Multitrack

This piece is an invitation to tune into the metaphysical energies of the current astrological Aquarian Age consciousness.[228] The tonal material is in *rāga Hamsadhvani*: I have super-imposed two major chords to create the notes of this pentatonic *rāga* in three keys, one for each of the three sections, here shown in Concert pitch.

- In C using C-E-G and G-B-D
- In F using F-A-C and C-E-G
- In B*b* using B*b*-D-F and F-A-C

The piece uses notes from ***śruti* 2** tuning system.

[228] Based on tropical astrology we have recently entered the Aquarian age, which will last c.2160 years.

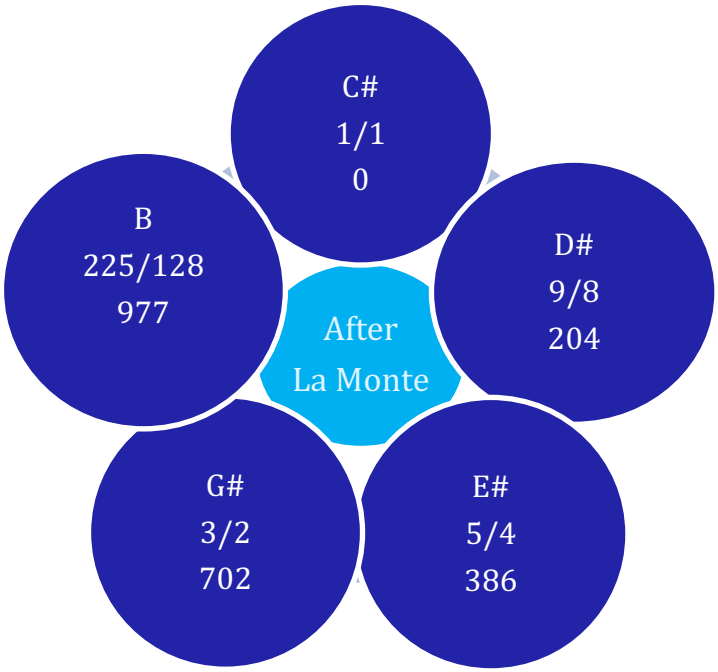
Portfolio 3 **Indian New Age**

This portfolio was the most difficult one for me to compose and organise. In these pieces there is more drama, layers and noise. This portfolio is a culmination of me testing the boundaries of my own artistic expression and is the portfolio I am least connected to. It was an integral part of the process for me to immerse in a contemporary music outlook at York, to see what opportunities and challenges I could work with. Attempts were made to 'contemporise' an approach to *rāga* music, and ultimately, I arrived at points that felt musically uncomfortable as there was a conflict with my initial intention to create music with respect to the Indian music traditions and music of a sound healing nature.

I have chosen to use the title Indian New Age, to highlight the genres that inspire the work. In India when promoting Indian fusion music, music that fuses *rāga* and Western music, they have sometimes used the term New Age, most likely drawing on the American term New Age, which was used to describe music for use in spiritual practices during the 1960's. The common theme in this portfolio is that I am an Indian music and creative sound healing composer: I am inclined to use Indian music devices, and always attempt to find a sense of harmony, stability, resolution, and *śānti* (peace). For me, the identity of this portfolio must be that it still links to my sound world. Indian music is hugely underrepresented in the UK, especially in Higher Education. The rationale for my approach to this portfolio rests ion the fact that Indian musicians have distinct voices that now require support for us to take distinctive pathways of expression, and do not conform with the current trends in contemporary music.

1	After La Monte	SR	Multitrack

This piece was a dedication to American composer La Monte Young. The tuning reminded me of Young's *The Well Tuned Piano*,[229] though it is not the exact tuning ratios.



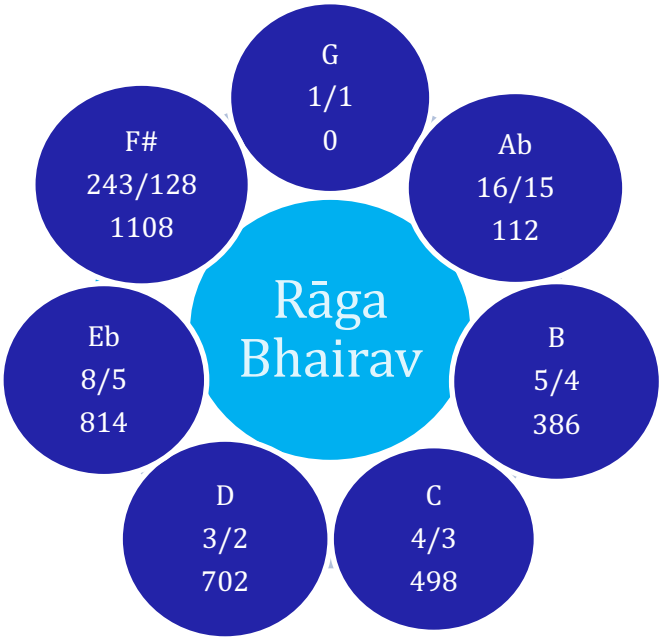
The piece is in C# and uses 5 notes which are among the first 9 harmonics of a string. I have used slow root and dominant ostinatos and cycled mid-range note pairs to establish the tonal interactions. This was the first multi layered work I composed for the CymaPhone, hence the reason for included it in this portfolio. I have used quick fade ins in the edits, creating a loud tonal attack. This creates the SR tones to be like the striking of a bell: a technique I continued to use in future compositions to give contrasting tonal SR attacks.

[229] La Monte Young, *The Well Tuned Piano*, US: Gramavision, 18-8701-1, 1987, CD.

2 Shiva's Light of the Morning | SR | Multitrack

This piece is in the *Śiva* associated sunrise *rāga Bhairav* in G.

Śrutis and *svaras* for this *sampūrṇa* morning *rāga*.



Unlike the pieces in the *Kāranam* Portfolio, I have taken a looser and less specific *rāga* rule approach to the notes of the *rāga,* where tones and phrases appear in no *rāga* based sequence, and were my own, at the time, freewill choices. In *Kāranam* I have created a whole set of *rāga* based compositions that kept as close to the grammar and *alāpa* approach of a traditional performance, but with respect to the added SR. In this piece I take a free and open approach to the tones of the *rāga.* This enables me to stretch the boundaries of the *rāga* grammar and creates an interesting contrast to the pieces in Portfolio 1. I have included it in this portfolio as it is a *rāga* inspired composition, and it sits well with the other pieces of this 21st century portfolio.

3 Passage SR Multitrack

This piece was commissioned by British Chinese painter Angela Lyn. Lyn is based in Lugano, Switzerland and on her painting style she says 'I am interested in the resonance and sustainability of an image.'[230] This statement gave me a good starting point for the collaboration. The piece *Passage* was used for immersive art gallery performances in Vila Arconati, Milan (18/09/2022),[231] Chambers Fine Art Gallery New York (18/07/2023),[232] and The Institute of Contemporary Art, Miami (05-05/04/2024).[233] Lyn asked me to write music reflecting the journey of two undefined beings who arrive on Earth via a wooden boat. They are lost and fascinated by the state of the planet, and journey to discover that they may have had an effect on the place they have arrived in. The piece had the addition of a Ballet choreography commission, performed by two ballet dancers choreographed by Durante Verzola of Miami Ballet. The piece I am presenting is an audio excerpt from this 35-minute commission, which included recorded saxophone, cello and found sounds.

The piece uses notes from *śruti* 1 and 2 systems.

The following video gives context for the composition, and an insight into the collaboration with movement and painting.

https://www.youtube.com/watch?v=VdXAanm1af0 .[234]

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[230] Angela Lyn, "Artist's Statement," *angelalyn* accessed July 13, 2024, https://angelalyn.com/intro/ .
[231] Cesare Rancillo, "Calendar," *villaarconati-far*, accessed May 27, 2024, https://www.villaarconati-far.it/ENG/events/side-by-side---on-the-edge-of-time_792691_C5.aspx.
[232] Christophe W. Mao, "Passage in the Wake of the World," *chambersfineart*, accessed May 27, 2024, http://www.chambersfineart.com/exhibitions/passage-in-the-wake-of-the-world.
[233] "Angela Lyn: "Passage – in the wake of the world," *icamiami*, accessed May 27, 2024, https://icamiami.org/program/angela-lyn-passage-in-the-wake-of-the-world/.
[234] Angela Lyn, "From the Window," *YouTube*, June 28, 2023, accessed May 27, 2024, https://www.youtube.com/watch?v=VdXAanm1af0.

Choral tested composing the whole piece as an SATB choral score before playing into the CymaPhone. Each of the four complete lines was recorded for each voice, leaving a thirty second gap between each note. The piece is in C minor.

Figure 22 Choral Notations

Eb	Eb	C	Eb	C	Eb	C	Eb
G	Ab	Ab	C	Ab	C	Ab	C
C	C	Eb	Eb	Eb	Eb	C	C
-	-	-	-	-	-	-	G

C	Eb	C	Eb	C	B	D	-
G	G	G	G	F	-	-	Ab
Bb	Ab	G	D	G	-	-	Eb
-	-	-	-	-	-	-	-

G	C	G	C	C	Eb	Eb	F
Eb	F	C	F	G	Ab	G	Ab
C	D	Ab	C	Eb	F	Eb	F
Eb	Eb	Eb	Eb	Ab	Ab	Ab	Ab

F	Eb	G	F	Eb	C	Eb	C	Eb	-
Ab	G	Eb	Eb	G	F	G	F	G	-
F	Eb	Ab	G	Eb	Eb	Eb	Eb	Eb	-
Ab	Ab	Ab	Ab	Ab	Ab	C	C	C	-

I was not convinced by the outcome: I was wanting richer SR tones; using pre-composed notation did not achieve this, and so I did not pursue the plan to create pieces exploring this choral concept. It is in the portfolio to demonstrate the testing of musical ideas. The process helped inform the approach for later works that had pre-composed note groupings; I created a listening dialogue between the SR to become a central part of the compositional shaping. This later improvisational way of composing worked well, especially as I was able to retain intricate details and respond quickly during the process.

The piece uses notes from ***śruti* 1** tuning system.

5 Sound Piece 1 SR Multitrack

This is an experimental piece where I have improvised into the CymaPhone on four themes on the alto saxophone. I decided to create pieces like this only at the end of year 1, as I wanted to not get into an experimental phase too early on; I had a lot of interesting investigations around the other themes of the work to carry out first. This way of playing and creating SR is a natural way to play the saxophone, especially given my free jazz and modal jazz background. This process enabled me to see the tonal boundaries of the saxophone generated SR. I gave the piece an ordinary name as it was essentially a sketch. I learnt a lot from creating this piece, as it was a useful guide for the creation of other works in this portfolio.

The four themes are:

- Low notes and their overtones: Concert D*b*, D, E*b* and E
- Whole tone shapes
- Improvised chordal shifts starting from concert D major 7
- Microtonal chordal descent finishing on concert E*b* major

The piece uses notes from ***śruti* 1** and ***śruti* 2** tuning system.

6 Sound Piece 2 SR Multitrack

This is an improvised piece exploring alto saxophone techniques that use semitone slides with bass notes underneath. This was structured in a way to create a buildup of the textures and then the piece ends with an *ālāpa* section in *rāga Bāgeśrī* in concert D. Like 'Sound piece 1' I decide to investigate the edge of the SR creation. I wanted to see the effect on the SR tones if I played microtonal slides that were outside of the *śrutis* that the piano was tuned to. I learnt a lot through the discovery of tonal colours that greatly informed the creation of SR tones in future compositions. The slides created both murky and clouded sounds, as well as shimmering textures where the vast array of microtones playfully dance with each other. By playing *Bāgeśrī* at the end I was testing to see if a *rāga* piece could sit well next to an experimental sound form. This experiment confirmed to me that I could place *rāgas* and New Age sound forms next to each other to create interesting soundscapes that were part of larger compositional works.

Semitone slides and bass notes. All concert pitch.

- F-F#, G-A*b*, with A*b* and E*b* in the bass.
- B*b*-B, F#-G, with F and F#in the bass
- A-B*b*, C-C#, G and A*b* the in bass
- A-A*b*, E-F and A*b* and E*b* in the bass

The piece uses notes from ***śruti* 2** tuning system.

7 All One | SR | Multitrack

This piece was imagined whilst I was using spiritual practices of merging into oneness, through non-dualism, integrative practices and Zen philosophy,

> This unity is like salt in water, like color in dyestuff. The slightest thing is not apart from self.[235]

There are two sections.

- A set of phrases contrasting high close clusters and wide expansive stacked notes. These sounds represent a pin drop compared to a wide ocean, akin to the contrast of the individual self to the Universal self, The 'I am', or big 'I' and little 'I'.
- Randomly sequenced Lydian[236] chords in concert D*b*, C, F, B*b*, E*b*, A*b*, G and A, and return home to C.

The piece uses notes from both śruti tuning systems.

[235] Paul Reps, *Zen Flesh, Zen Bones*, (London, UK: Penguin, 1971), 172.
[236] This refers to the modern use of the Lydian mode, i.e. a major scale with sharp 4th.

8 Sun in Scorpio | SR | Multitrack

This piece is my sound perception of the astrological sign of Scorpio. There are three sections based on a Scorpio meditation of picturing a lake (G major 9 chord) in the mountains (stacked 4ths), after which one sees the image of becoming an Eagle (high *śruti* pairs) flying into the golden Sun (E major). The intention of this journey through sound, is to raise the spirit up. To have a sense of the highest form of Scorpio energy. The piece can be used to assist the individual who has a Scorpio sun, moon or ascendant. It can also be used to understand the individual who has a Scorpio sun, moon or ascendant. The first part in G major offers the SR tones in a direct way with soft fades. This contrasts with the gong like appearance of the stacked 4ths, which use short fades to represent the overwhelming presence of a huge mountainous vista. The last section in E major uses the longest fades; they give a soft and velvety texture to the sound. The contrasting aspects of the SR creation and editing discovered in earlier pieces serve the creation of a precisely constructed composition and make it easier to represent a very clear inner visual picture through sound journeying.

The piece uses notes from ***śruti* 2** tuning system.

9 Sun in Leo | SR | Multitrack

A piece to immerse in my sound perception of the astrological sign of Leo. There are three chordal centres exploring the tritone polytonality of a dominant 7th on concert C7, E♭7 and F#7. I use the same chord to demonstrate the power of the sun and the leadership qualities of the sun sign Leo. It feels fiercely strong and fixed on a goal, like that of a lion.

The piece uses notes from ***śruti* 2** tuning system.

Portfolio 4 **In Sympathy**

Presented here is a portfolio that encompasses the full scope of the research output of the project. The compositions give clarity to the work covered in the last four years, 2020-2024.

- Prep year, 2020
- Composing, PhD years one to three, 2021-24

The compositions draw on the stylistic nature of Portfolios 1-3. There are numbered Portfolio references **(P1, P2 or P3)** for each composition to identify their thematic origin.

The portfolio is arranged like a traditional vinyl album release; there is a storyline to the portfolio, so the reveal is left to the end, we do not know what has created the sound until we hear the saxophone together with the SR, in fact we may not even realise that we are listening to SR.

1 Harmony Balance | SR | Multitrack

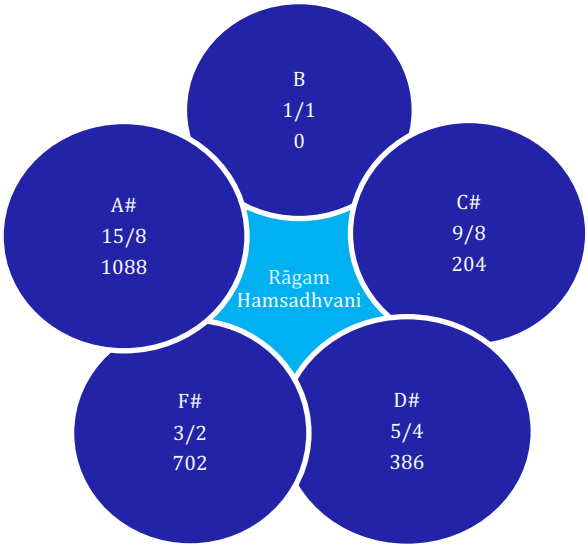
Harmony Balance (P2) is an overture to the portfolio allowing the listener to immerse in the beauty of the resonance, and is an homage to those who achieve balance in life: a sturdy fulcrum with each receptacle on the right and left of equal measure, a harmony of principles found in the natural sound world.

An SR piece using baritone and alto saxophones in *rāgam Haṃsadhvani.* A Carnatic *rāgam*, whose name means call of the swan. *Haṃsa* (Swan) is the vehicle ridden by *Sarasvati*, and she brings with her from the ethereal world a wonderful balance of will, wisdom, and love, through manifestation, knowledge and music.

Pitches used (′denotes the higher octave):

Alto:	D#	F#	A#	D#′	F#′	
Baritone:	B	D#	F#	B′	C#′	D#′

The phrases have a pulse to them, and there is a long space at the end of each phrase, which gets bigger after each phrase, to allow the listener to immerse in the sound.



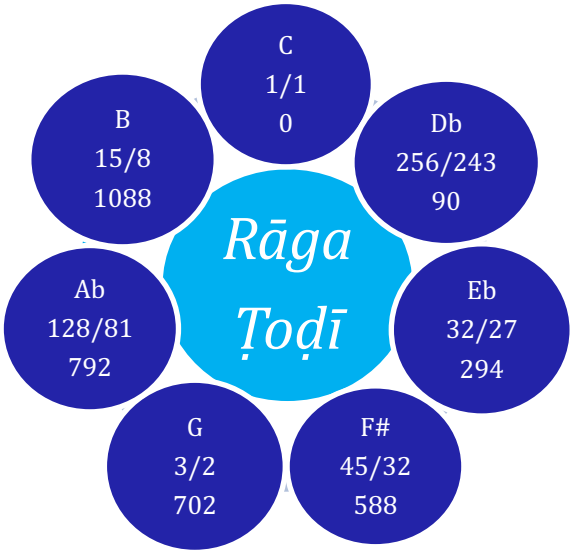
(P3) This piece is all about Uranus, the transformational Trans-Saturnian planet. First, we view and approach this electrical infused sphere, thereafter we experience its unpredictability and then transform into a world of kinship and collective beauty. A dedication to German astronomer and composer William Herschel[237] (1738-1822) and was first presented at a seminar in York (19/06/2022) honoring the life and 200th death anniversary of one of the world's most significant astronomers. I played alto saxophone along with the prerecorded piece at the seminar, but I am submitting just the prerecorded piece here as the playing did not add to the composition. In *Vedic* astrology Uranus is called Harshal (a mispronounced Herschel I suspect) or *Prajapati* (a version of *Brahma*, the master of creation.) Uranus is the great awakener and seeks freedom and individuality through forced change, and its energy is great for research as it manifests ideas in an electric flash. The premiere of this piece was in the Rymer Auditorium, University of York, and on the same day I accidently got a mains electric shock, which highlights the power of planetary influences.

The piece focuses on the transformation of the microtonal shift of an **A*b***.[238]

- A*b first* appears as the Dha (*b*6) of *rāga Ṭoḍī* from C, tuned eight cents below than the ET *b*6.
- To transition to the second section, I introduce a second A*b* tuned 22 cents above than the first A*b*.
- The second A*b* is the A*b* major tonic, tuned 14 cents above the ET A*b*.
- The major third from A*b*, C, is tuned to ET so it is a pure major third, 5/4 or -14 cents in relation to the A*b* tonic: This shifting tonal device became a starting point for the creative composition.

[237] William Herschel: Born in Hanover, Germany November 15th1738 and died in Slough, UK, August 25, 1822.
[238] All notes are in concert pitch.

Śrutis Aand s*varas* for *rāga Ṭoḍī*.



Ārohaṇa

S	R	G	M	P	D	N	Ṡ
C	Db	Eb	F#	G	Ab	B	C′

Avarohana

Ṡ	N	D	P	M	G	R	S
C′	B	Ab	G	F#	Eb	Db	C

As a prequel I have composed a section that evokes a picture of approaching this unknown icy giant planet. It rotates in a unique way, by appearing to roll like a ball through the sky, rather than spinning on its own axis like all its fellow planets in the solar system. Uranus has a very mysterious quality, hence the ambiguous sound I have created to emphasise this.

The second section, *rāga Ṭoḍī* in C, begins with a Minirig bluetooth speaker generated SR drone of concert C A*b* E*b*.[239]

The SR created by saxophone is a *rāga ālāpa;* during the seminar performance served as a guide for me to play live alto saxophone over the top. I preempted and played in between the SR drone phrases…

[239]"Minirig 3 review - Why this is the bluetooth speaker you should buy!," *audiophileon*, accessed March 10, 2024, https://www.audiophileon.com/news/minirig-3-review.

S, Ṇ Ṇ S, G, Ṁ G R, G Ṁ D, N D P,

The third section appears with a gentle fade in of looped pairs in A*b* Lydian: The pairs played on alto saxophone are low D and mid B*b*, low A and mid F, mid C and mid A.[240] It takes 84 years for Uranus to cycle around the sun, Herschel was in his eighty fourth year when he died, and it is interesting to note Uranus was in the fourth degree of Capricorn when he was born and died. The looped phrases last for 12,14 and 16 seconds, though they loop in fractional forms of themselves; a quarter or half of their length: 3x7x4=84. I improvised on alto saxophone in A*b* Lydian,[241] and Indian *rāga Pūriyā Kalyān* (Lydian[242] with a flat second) over these loops as part of the performance in 2022.

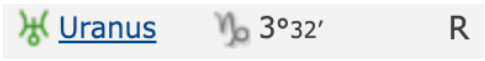
On that day I met astronomer Professor Woodruff Sullivan, Hershel's biographer, who was at the performance. He disputed my claim that Hershel was born and died when Uranus was in the fourth degree of Capricorn. I assumed a professor of astronomy must be right, but then a Uranian flash came to me as I drove home, Uranus must have retrograded, and after consulting with a reputable online astrological calculator[243] it had retrograded: (Figures 23-26)

Uranus in Capricorn, 15/11/1738 in Hanover, Germany.

Figure 23 *Uranus degree at birth*

Uranus retrograde (R) in Capricorn 25/08/1822 in Slough, UK.

Figure 24 *Uranus degree at death*



[240] F Db, C Ab and Eb C in Concert pitch.
[241] Known as Phrygian in the anceint Greek modal system.
[242] ibid
[243] https://horoscopes.astro-seek.com/birth-chart-horoscope-online, accessed Nov 3, 2024.

Figure 25 *Natal Chart W. Herschel*[244]

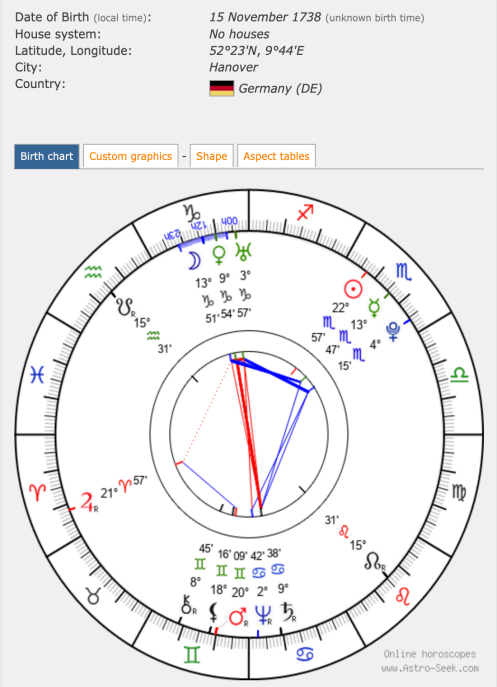
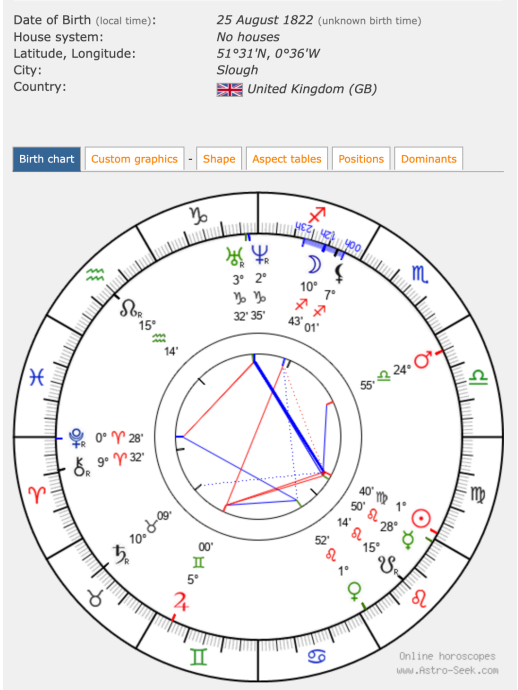
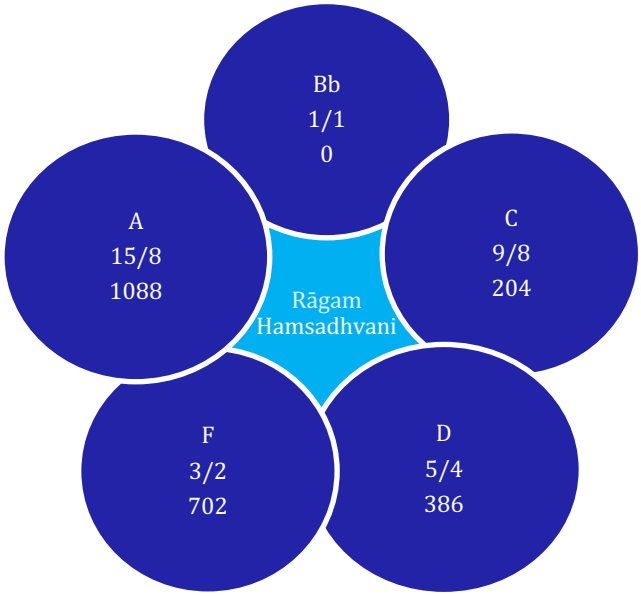


Figure 26 *Legacy Chart W. Herschel*[245]



[244] Petr Soural, "Birth chart," *astro-seek*, accessed March 7, 2024, https://bit.ly/3v8sfVJ.
[245] Petr Soural, "Birth chart," *astro-seek*, accessed March 7, 2024, https://bit.ly/4cDLsyP.

(P2) This is a Yoga of Sound piece and is a simple composition designed to take the listener's imagination to a peaceful lake. The piece is in B*b* and is in *rāgam Hamsadhvani.*



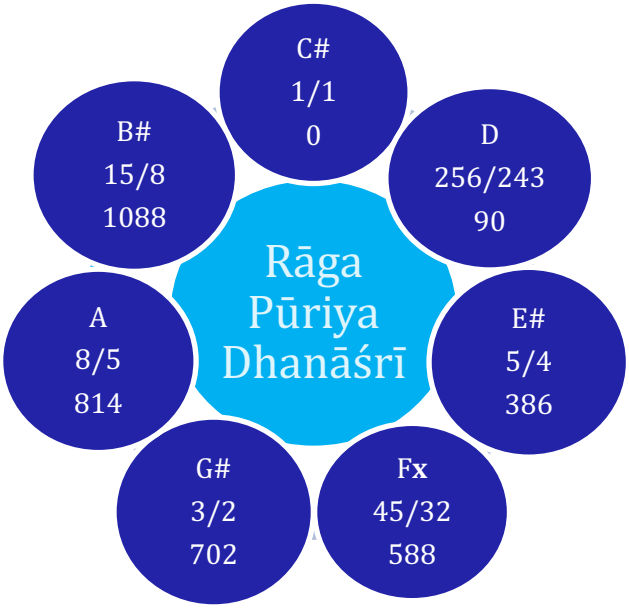
In this piece the notes are offered in a simple way with four note phrases in the *rāgam* drifting into silence, to allow the listener to experience the purity of the tones. You may note that the sonic experience is different to the first piece in this portfolio, even though the same five notes are used.

(P3) Once at safe rest we can delve into the unknown world of vibration and begin a challenging journey in **22**, where microtonal textures create uncertainty. The notes gleefully fight with each other trying to create a new fire and form through their interactive friction, like a dive into the pool of celestial sound emerging in the origin of our sound source.

This piece is called 22 as I am using a lot of high pitched *śruti* pairs that are 22 cents apart, to create a bell like tonal effect. Underneath there are very low long notes of baritone saxophone SR in intervals of 4ths and 5ths to create a sense of wide expanse, which combined with the microtonal textures are intended to evoke a challenging path for the listener. In this piece I have used dramatic volume shifts and silence to emphasise the depth of the baritone SR notes.

In the second section I move into a chromaticism to arrive at an otherworldly section in *rāga Pūriyā Dhanāśrī* in C#, where the phrases are drawn out, which give the listener a moment of sonic rest to maybe reflect on where they have arrived after the initial intense and challenging journey.

Śrutis and *svaras* of this *audava- sampūrṇa rāga*.



Ārohaṇa

Ṅ	R̲	G	Ṁ	D̲	N	Ṡ
‘B#	D	E#	F**x**	A	C	C#’

Avarohana

Ṡ	N	D̲	P	Ṁ	G	R̲	S
C#’	B#	A	G#	F**x**	E#	D	C#

The piece then moves into an octave and microtonal section where we hear *śruti* pairs again, like a call to awaken before it is too late. We then drift off into a major tonality with some microtonal shading, an almost open setting to allow the listener to form their own picture. The piece resolves with a suspended minor chord phrase merging into a shimmering major chord.

(P2) The challenging journey of 22 allows us to be crowned in **Illumination**: Without the struggle there would be no reward. This piece is a homeopathic dose, a short piece, so as not to unearth the listener; the high frequencies can trigger the mind to forget the earthly body, and on coming back to a body conscious state after hearing the piece, the listener may feel dis-orientated. The piece is created using the higher registers of the flute and alto saxophone to create the SR. The piece is in a diatonic JI major scale with a flat 7th, and I make use of *śruti* pairs to create a bell like resonance that gets the eardrums vibrating. At the end I use a microtonal descent and last bell note to give a completion to the piece. The piece was composed as part of the *cakra* healing album and is tuned into the consciousness of the crown *cakra*, *sahasrāra*:

> Sahasrara is situated at the crown of the head and is associated with the pituitary gland. When this chakra is fully activated by kundalini it is the highest experience of human evolution.[246]

This gives the inspiration for the intention and creation of the *Yogic* and *rāga* aspect of the compositions. The title of the piece expresses this opening of the body-mind consciousness.

[246] Svātmārāma, *Haṭha Yoga Pradīpikā,* c1350, trans. Swami Muktibodhananda (Munger, Bihar, India: Yoga Publications Trust, 1998), 162.

(P2) This piece was composed using the esoteric and scientific knowledge of the rainbow, the prism and the *rāga* colour wheel, and is in three parts.

Rainbow

There are six phrases exploring six different *rāgas* in their scale form. I have chosen the *rāgas* by using my intuition and experimenting with the phrases and listening to the sonic quality.

Bhairav (C), *Yaman* (F), *Hamsadhvani* (A*b*), *Sohinī* (G), *Sārang* (G), *Khamāj* (A*b*). To create the SR phrases, I played four three-note phrases in each *rāga*.

Bihāg

Rāga Bihāg is a romantic evening *rāga*. I have diverged from the initial process of SR creation in this section: by playing single notes on the alto saxophone I have created eight piano SR notes for *rāga Bihāg*, then using these eight SR notes I have created, by editing in logic pro X, an *ālāpa* of the *rāga*. The *rāga* phrases are heard in a traditional ICM melodic form but voiced with SR tones. This idea was going to progress into making a sample library to play on a keyboard, though as documented in the beginning of this chapter I did not pursue the idea.

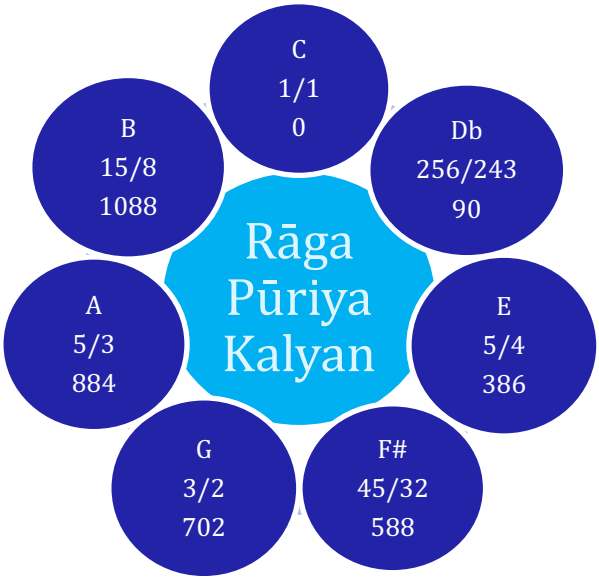
Clouds

This section was created after listening to the first two sections; I was asking myself, "what have I experienced from this sound journey so far?" I concluded that it was useful to reflect in an abstract way on what sound world and experience I have immersed in. I have played full scale phrases of intuitively chosen *rāgas Pūrvī*, *Kāfī*, *Khamāj*, *Ṭoḍī*, *Khamāj*, *Māravā*, *Āsāvarī* and back to *Pūrvī* and allowed them to float independent of any musical idea, to allow a free flow abstract immersion into the sound.

I have used tunings from ***śruti* 1** and ***śruti* 2**.

***Rāga Pūriyā Kalyān* (P1),** a solely SR piece created using alto saxophone, scribes a *rāga ālāpa* over a saxophone generated Sa drone. The piece offers the listener a detailed insight into the ideas behind the starting point of the PhD research. The *ālāpa* is loosely based on the grammar of the *rāga;* due to this being an SR piece I took some liberty with the phrasing to give the composition a clear aesthetic, where the SR, rather than the *rāga* grammar, is emphasised.

Śr*utis* and *svaras* of this *audava- sampūrṇa rāga*.



Ārohaṇa

Ṅ	R̲	G	Ṁ	D	N	Ṡ
‘B	Db	E	F#	A	B	C’

Avarohana

Ṡ	N	D	P	Ṁ	G	R̲	S
C’	B	A	G	F#	E	Db	C

The *ālāpa* phrases

S, N, DN, M̓DNS.

(M̓)N, P, M̓DNS.

N, NR̲G, M̓G, M̓GR̲S.

GM̓, P, M̓, G, GR̲S.

M̓G, GDN, NDP, M̓G, (G)R̲S.

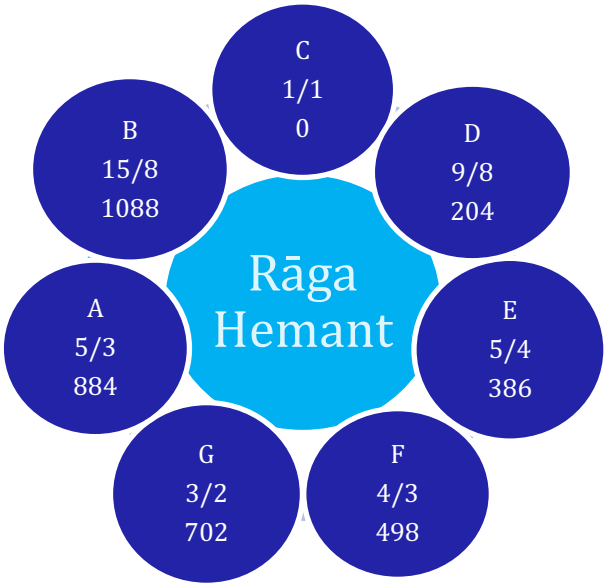
GM̓DN--Ṡ, ĠṠ, M̓DNṠ--Ġ, SĠM̓Ṗ, Ṁ̓Ġ, ĠM̓, Ṁ̓ĠṠ.

P, M̓G, GR̲S, S.

8 Rāga Hemant | SR and live saxophone | Multitrack

Rāga Hemant (P1) lays bare the PhD research, where the live saxophone gives the listener a direct experience of the sound generator and SR created at the same time. The playing style is a mix of traditional *auchar alāpa,* where the movements of the *rāga* are shown with fast and long *alāpa* phrasing, and the PhD SR playing style of using gaps to allow the SR to be experienced.

Śrutis and *svaras* of this *audava- sampūrṇa autumn season rāga.*



Ārohaṇa

S	G	M	D	N	Ṡ
C	E	F	A	B	C′

Avarohana

Ṡ	N	D	P	M	G	R	S
C′	B	A	G	F#	E	D	C

18 (P3) is a geometric sound jaunt using chords that are inspired by the harmonies of French 20th Century composers. I have introduced sound worlds using six *audava rāgas,* using alto saxophone generated SR root pentatonic *rāgas.* These root *rāgas* appear over single SR tone baselines generated by baritone saxophone. The piece uses the musical devices of oblique motion and pedal notes.

Figure 27 Table of Pentatonic shifts in '18.'

	Root Rāga[247]	Bass – *rāga* mode		
1	Bhūpālī in D S R G P D	B making Dhāni	F making Māravā	C making Yaman
2	Sārang in A S R M P N	D making Śyām Kalyan	B making *Bāgeśrī*	F making Hindol with two G's
3	Hindol in Eb S G M D N	Eb Hindol	A Hindol	B Hindol
4	Hamsadhvani in Ab S R G P N	C making Pancham Koś	Db making Kalyān	Ab making Hamsadhvani
5	Patdīp Ārohaṇaṇa in F S g M P N	F making Patdīp	Bb making Vācaspati	E making Altered chord
6	Hamsadhvani in Gb S R G P N	Bb making Bhairavi	B making Kalyān	Gb making Hamsadhvani

The music is shown in long note form first, where the transitions are slow and smooth.

I then introduce an electro acoustic pulse, created by evenly cropping a long SR note. I use a 16th note quantize in logic pro X to create this crop. I then use this cropped note to create micro panning of the long-cropped SR note. It

[247] All notes in this table are *shudh* or *tivra* except where the letter is lower case: g is flat ga and M is sharp Ma.

sounds like programmed electronic music, but the fluctuations are not manufactured so they retain a natural feel, fade and pulsing.

This particular way of creating music using *rāgas* with modal shifts is not *rāga* music, so you could say it is extended *rāga* technique or *rāga* inspired. It may just demonstrate how perceiving *rāgas* as merely notes destroys the essence of its origins, though it is inspired by the concept of *mūrchanā* (modulation/rotation) used in ICM to show different root notes within the notes of a *rāga.*[248]

The piece uses notes from ***śruti* 2** tuning system.

[248] There are recorded examples of showing how the pentatonic *rāga* Mālkauns can be shown from SA (Mālkauns), GA (Durga), MA (Dhani), DHA (Bhūpālī) and NI (Megh). Chakraborty, Ajoy *Rāgas Bāgeśrī and Malkauns,* (India: Sony Nād 8869759650 2, 2009).

Chapter 5 Conclusion

As outlined in Chapter 1, the PhD 'intersects varied modes of understanding and practice…', which encompassed diverse esoteric, academic and creative approaches to the practice based theoretical investigations of *śruti* tuning and *rāga* and sound healing based compositional investigation. Through these modes of thinking, doing and feeling I have created a portfolio of compositions demonstrating the bringing together of these varied approaches. This connectivity to diverse cultural concepts, and a bringing together of the outer and inner world of sound required an approach to knowledge that was carefully considered. The overall research framework laid out in Chapter 1 provided form to a project that adds to the body of knowledge of current practice within Western music academia.

The compositions are the main aspect of the PhD, and they sit alone as a body of work that can ably demonstrate the expression of both the Sympathetic Resonance (SR) possibilities of the CymaPhone and my creative abilities as a composer and producer. With conscious intention, I have carefully constructed and implemented a body of work exploring how the CymaPhone allows the creation of distinctive sound worlds, and music that explores the realms of *rāga*, sound healing and Indian New Age composition.

My vision at the start of the project was clear, and the outcomes are presented to give a good understanding of creating music with practices that all fed each other:

- Theoretical: Tuning
- Practical: CymaPhone
- Creative: *Rāga*
- Spiritual: Intention

This approach gave the project room to develop, pushing the boundaries of the research and output of the PhD,

- The applied tuning theories enabled new tonal relationships for creating the compositions.

- The CymaPhone production and bodily awareness demonstrates applied practical solutions specific to creating the SR.
- The creative application of *rāga* knowledge was key to deepening researched tonal discoveries within cross cultural composition.
- The PhD enriches existing research using spiritual practices as a guide and framework for the creation of compositional works.

Stated in Chapter 1, is the clear project intention, that through a… 'link to a higher consciousness…' I will create a portfolio of music. If the music makes this profound connection for the listener then my practice will have succeeded in its aims.

The project aims to make an original contribution to the following individual aspects of musical investigation and creation.

1. Sympathetic Resonance
2. Fixed note micro-tuning
3. *Rāga* on saxophone
4. Sound healing
5. Indian New Age composition in the 21st Century

Sympathetic Resonance. The solo SR aspect of the project is an original contribution to piano composition. In developing the CymaPhone, a new electro acoustic instrument has been designed and created, and its effect can be profound if handled carefully. The full body of SR works including the portfolio presents a large body of work exploring recorded SR and the work demonstrates the depth and possibilities of creating SR tonal material.

Fixed note micro-tuning. The commentary demonstrates the complexities around fixed note tunings and Indian tunings through *śruti.* The research presents practical solutions for retuning a twelve notes per octave, fixed string instrument, and goes beyond a solely mathematical approach, demonstrating the viability of expanding music repertoire for future compositions. My investigation and development of fixed note tunings can offer an insight into both the complexities and solutions available to the practice of applied tuning theories. After conducting research on historical piano tunings and *rāga śrutis*, I have redeveloped two tunings that can be

used for musical exploration and creativity. The first system, ***Śruti* 1**, has been previously used (Riley, Harrison, Lamb). The PhD expands the potential of this tuning system to enable innovation in solo piano composition.

***Śruti* 2** is an original tuning system with more scope for investigation due to its unique tonal relationships. ***Śruti* 2** is not a new approach to the mathematics of *śruti*, though it may be the first instance that uses twenty-two *śruti* divisions of the octave on an instrument using a twelve-note chromatic octave. Previous uses of JI on twelve note keyboard instruments and Indian influenced tunings have limited the playing of modal music to six keys. The system I have developed means one can play modal music in all twelve key centres, major and minor: I calculated the practical possibilities mathematically using Pingala's *vedic Meru Prastara*: pointing the way to the application of similar mathematical principles to lead us to new tuning solutions.

***Rāga* on saxophone.** My research has developed *rāgas* on saxophone by incorporating SR during traditional *rāga* renditions. 'The addition of SR to the performance of Indian Classical Music (ICM) on saxophone brings the genre closer to the traditional style of ICM instrumental *rāga* playing, with the potential to transform that style. This innovation can be implemented in the future in a permanent manner, either acoustically with the CymaPhone or digitally with a CymaPhone mobile phone app, VR headset, or software-based solution that is digitally triggered by an external acoustic instrument.

Sound healing. By prioritising the effects of sound and music on both musicians and listeners, this PhD demonstrates how to produce highly intentioned music that can be applied to positively impact holistic health through the modality of sound healing.

Indian New Age composition in the 21st Century. Artists are known for introducing something new or for transmuting an existing concept. In this project, I fall into the latter category, where my approach results in a new method of forming sound through tones, clusters, and waveforms. My training as a musician was not straightforward; I learnt mainly by hearing,

mimicking, and testing out musical ideas. As a mixed-race person with a multi-cultural upbringing and a multi-faceted philosophical approach to living, neither myself, and importantly my music belongs in specific categories. As a composer I have taken different approaches to music, demonstrating how a modern musician can look for ways beyond the Western Art Music (WAM) traditions to enable new expressive approaches to music and composition. In view of all of this and given that my life has straddled two centuries, I have produced a PhD that is future-orientated with respect to living traditions. In the portfolios my musical style shifts from New Age to Spectral to Microtonal to Classical to Jazz … and as such confirms my identity as a 21st Century musician producing a body of original work relevant to the 21st Century.

Concluding statement

To conclude, the PhD presents the concept, design and implementation of a project that documents and develops musical knowledge, bringing together divergent elements of thinking, doing and feeling. The scope and depth of the practical investigation and documented output exists as a contribution to higher education music research, especially in the areas of cross-cultural and pluralistic approaches to knowledge.

I set out to test the 22 *śruti* tuning theories, where I have used clear practice-based methods, and created solutions that add to the body of tuning theory for practical use; most especially in microtonal, *rāga* and sound healing music and composition.

The methodological theory and practical set up required to create the CymaPhone is a contribution in instrument design and augmentation. With this documentation and further sharing of the work, the PhD demonstrates how the CymaPhone can directly communicate the complexities of tuning, *rāga*, sound healing and microtonality.

I have made an in depth practice-based contribution to *rāga* composition, where I have tested and developed the use of *rāga* as composer within the form of SR and Indian Classical saxophone.

Potential Future Contributions. This project was a turning point in my musical career, as it gave me time to compose and reflect on ways I was creating music, and most profoundly what could be the effect of the music I was creating. Given the gifts of my musical past and the support I have received from my deeply revered music teachers and spiritual guides, I am now able to further this project beyond the PhD. I will develop the compositional approach to create new work and, more fundamentally, create projects where well-being is at the heart of the work. I still have some avenues of research, that I could not cover, that will require new pianos, locations and financial resources. I have already confirmed opportunities to take the project out to performance spaces, educational institutions, site specific spaces and health centres including St Thomas and Guys Hospital, London. My aim is to engage listeners, artists, and teachers in the work as I believe it validates the research and offers scope to successfully disseminate the findings. I plan to produce a live tour of the CymaPhone as a performance and immersive art installation. The music recordings will be released as albums, and I plan to develop my work as a sound healer with both the recordings and live CymaPhone. It may be that in the future, the piano will be easily retuned and placed on its side, ready to receive the sounds of an intrepid musician, searching for the inner nature of acoustically produced tones from an instrument or voice. It may even be a useful assistant to musical ear training, encouraging a heightened awareness of pinpoint tuning, quiet listening and inner reflections that could all assist both the creative process and well-being of the creators and listeners.

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