MELODIÆ INCOGNITA;

EXPLORING THE

BOHLEN–PIERCE SCALE

AN EXEGESIS IN FIVE PARTS

In fulfillment of the requirements of the DOCTOR OF CREATIVE ARTS degree offered by the UNIVERSITY OF TECHNOLOGY SYDNEY

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And certified thereby to be his own original work in every salient particular.

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Θα προτιμούσα να είμαι τυχερός παρά έξυπνος.
Johannes Dobeus Præstigiator, *Crede Quod Habes, Et Habes*, 1525

CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Rowan Glyndwr Holmes, declare that this exegesis is submitted in fulfilment of the requirements of the award of Doctor of Creative Arts, in the Faculty of Arts and Social Sciences at the University of Technology Sydney.

This exegesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the exegesis. This document has not been submitted for qualifications at any other academic institution.

Production Note:
Signature removed prior to publication.

Rowan Holmes
Chaoflux, Setting Orange 50 Chaos YOLD 3186
(Wednesday 19 February 2020 Old Calendar)

(Revised Edition: Bureflux, Prickle-Prickle 50 Bureaucracy YOLD 3186
(Sunday 27 September 2020 Old Calendar))

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DEDICATION TO THE REVISED EDITION, BCY 3186 (SEP 2020)

Whatever remains of merit in this exegesis is souspirably dedicated to the late Professor Alasdair Gray of Glasgow, who also:

- ☞ Strove to write of complex things with the utmost clarity and elegance; and also
- ☞ Took great care with the appearance and style of his books; and also
- ☞ Resented interference (even well-meant interference) with their layout and content, and also;
- ☞ Thoroughly divided the critics and slept the better for it.

IN MEMORIAM 3100-3185 (1934-2019)

(With thanks to Steven Rae for the initial suggestion.)

ACKNOWLEDGEMENTS

Much as it might appear so to the doctoral student, an exegesis is not created in isolation. Many factors and individuals affect the process, for good and ill. It is traditional to mention at least some of these in preamble, and in this case I will bow to tradition.

Any acknowledgements must begin with my wife, for reasons of which she is well aware and which could not be listed in anything approaching proper detail here. I would also like to explicitly thank my fellow musicians and friends, David Manning and Terry Buckridge, the latter also a fellow performer in the Spectral Om Ensemble. Without their constant help and encouragement, these words would likely not have been written at all. I must also particularly thank Korowal School in Hazelbrook in the Blue Mountains for its diligent and nurturing care of my children while this project was being undertaken—a care that in many ways went well beyond the call of mere duty. My adored children themselves had to deal all-too-often with a father discernibly short of time, temper and sleep. Kimberley Bianca of the University of New South Wales took an open-platform approach to her custody of the Electrofringe Festival of electronic music in Sydney; I thank her for this philosophy, which resulted in the Ensemble performing twice at Electrofringe, and I wish her all the very best with her current doctoral studies in Colorado. I thank my friends who bravely read drafts of the work in progress.

Associate Professor Clare Maclean and Dr Andrew Milne of the University of Western Sydney were unfailingly helpful and encouraging, and this process, which has often proven trying beyond the normal experience of such things, very nearly wound up being finished under their aegis. The intrepid sponsors of my initial application for doctoral study also have my deep and abiding gratitude. I hope this document is sufficient reward for their faith.

I would also like to thank and acknowledge the MARCS Institute for Brain, Behaviour and Development, also of the University of Western Sydney, for its offer of a fully funded scholarship to convert my studies into a more conventional PhD in music perception and cognition. I have often since regretted the nevertheless pressing personal reasons that led me to reluctantly refuse the offer. I am also deeply grateful to the academics and journals who published and otherwise supported my research in Australian history—a process that is now outside the ambit of this document, although it was an outgrowth of early research into possible final creative products. These specifically include Paul Sprute of *Global Histories: A Student Journal* and Associate Professor Carol Liston of *The Journal of the Royal Australian Historical Society*.

I will refrain, on advice, from directly acknowledging the entirely negative contributions of certain particular academics and institutions who helped in their various ways to make the doctoral process seem even more like a cruel, absurd, pointless and extremely cynical hazing ritual than it otherwise might. However, like a Roman emperor in partially yielding to the pleas of a citizen's influential friends for a black mark to be removed from his record, 'I want the erasure to show'.[1]

[1] 'Litura tamen exstet'. Suetonius, *De Vita Cæsarum*, Claudius, 16 (Thayer 2012).

Acknowledgements of this kind traditionally conclude by approvingly mentioning the author's parents, but in my case frankly I would rather not even mention their names. My cats, Dhūmra and Nīlagra, were more helpful and more humane, and my ex-parents did everything in their once-considerable power to discourage and to prevent me from becoming a musician. If it was up to them, this document would not exist at all; they are therefore the last people in the world to have any right to preen themselves by such faint refulgence as may eventually reach them. I do regret that my late brother, a musician himself and of no mean attainment, did not live to read (or to refuse to read) this document. He would probably have shrugged equivocally—it was the way he evaluated most of my endeavours, musical and otherwise—but on balance, he might have secretly approved.

I acknowledge the assistance of the Research Scholarships Section of the Graduate Research School of the University of Technology Sydney for their furnishing of a small but significant Thesis Completion Equity Grant to me in September 2019, and some smaller general Equity Scholarships in previous years. The funding provided in 2019 made it possible for me to expand my practice in a number of highly worthwhile ways, including the provision of adaptive technology to help with chronic illness, the obtaining of enough external storage devices to finally be able to back up all the files relating to this project, and the purchase of new software instruments and the tools to work on possible new hardware approaches. If the funds did not make up for a long and desperately weary period of virtual destitution during the earlier years of the doctorate, when I had no financial support whatsoever for this research, they at least made it possible to complete it in a far more respectable form than would otherwise be the case, and I am grateful for that. This exegesis has been professionally copyedited by Kylie Lowe in line with the Guidelines for Editing Research Theses and sections D and E of the Australian Standards for Editing Practice. I thank her for her efforts.

Finally, I would also like to particularly acknowledge the practitioners of *musiqi-e assil* (or the Iranian or Persian classical style[2]), among whom Ostâdân (Masters/Maestri) Mohammad-Rezâ Lotfi, Ahmad Ebâdi, Dariush Talâ'i, Parviz Meshkatian and Hossein Alizâdeh come particularly to mind. Their immense skill at performance and deep commitment to beauty have been constant companions and admonitions throughout this pilgrimage.[3]

[2] See Professor Laudan Nooshin's discussion of this significant distinction in Nooshin (2003), p. 243, footnote 8.

[3] Needless to say in one sense—but very necessary to say in another, given current geopolitical events—the musicians of Iran are no more responsible for the current political organisation and objectives of their nation than Australian musicians are responsible for our own.

STATEMENT OF THESIS FORMAT

This doctoral thesis consists of the exegesis here present and a series of accompanying creative works in the form of musical pieces. Seventeen of these are presented as a coherent artistic whole in the form of a 'virtual album' of approximately two CD lengths. This is entitled *Plaksha: Authentic Music of the Ancient Laramidians*, and it can be accessed at the address:

<https://cloudstor.aarnet.edu.au/plus/s/LSJhyx7vBfshQ7H>.

Plaksha: Authentic Music of the Ancient Laramidians

Track Listing

	The music of Suloma (South Appalachia)	Type	Duration
1	Grāvā	Folk	0:54
2	Madhyapatita	Folk	0:50
3	Nagodara	Folk	3:34
4	Krāntipātagati	Courtly	2:34
5	Mārgaśodhaka	Courtly	8:07
6	Pavanamāyā	Sacred	24:22
7	Mattavāraṇa	Sacred	16:35
	The music of Sūrmi (North Appalachia)		
8	Makṣikatoupan	Folk	1:03
9	Dārudaśrava	Courtly	3:43
10	Tārakitadravaja	Courtly	8:28
11	Antarhāsa	Sacred	5:01
12	Parṇavādya	Sacred	4:19
	The music of Praśāsitṛ (The Island of Laramidia)		
13	Nakṣatravinoda	Popular	8:06
14	Vyālamṛganṛtya	Popular	3:22
15	Vṛkatātviśvavidyālaya	Courtly	21:23
16	Tatpara	Sacred	7:43
17	Kṛtrimakeśāvartī	Decadent	4:07

PREFACE

He must sow in tears that others may reap in joy.
Frater Perdurabo, *Liber 536*

A preface to a conventional doctoral thesis is sometimes used to contain personal material considered 'irrelevant' to the main body of the text and the exposition of the research and its findings. But this is a 'creative' dissertation, which is partly a record of a personal creative journey into and within a system of making music—the Bohlen–Pierce or BP scale—which is 'new'. So new, in fact, that it was first articulated in theory in 1971, and the body of work in the system is presently slim at best. As will be further expounded in Part 1, 'BP' is *so* new that the question of the bearing of conventional music theory upon it is one of the matters investigated here.

Precisely because of this 'newness', areas of theory and perhaps even practice that might not enter into an exegesis, even a 'creative' one, about a more established system have necessarily come into play in this project. The lack of a single defined and established 'BP theory' raises questions about the philosophy of music—and is affected by questions about the perception and cognition of music—which cannot be evaded if justice is to be done to the subject. That, at any rate, is how I feel about it, which seems an opportune point to add some prefatory remarks about my own background and creative practice. (I use the first person throughout because I became weary of paraphrases.)

My experience as an 'underground'/'experimental' musician stretches across three or four decades. I was originally self-taught in the days of 'bedroom electronica' in the early- and mid-1980s, when the first generation of digital synthesisers and the advent of the cassette-based portable 4-track recorder made it possible to do whatever one pleased within the limitations of the technology. And, working with a collaborator, that is what I did. The resulting 'bleeps and blorps' attracted some amusement, some irritation and some airplay, but never enough of any of these things to make it finally worthwhile to keep the project going. Some of the stronger influences were Throbbing Gristle, The Residents, Suicide and Chrome, as well as Australian 'lo-fi' acts of the sort given an airing by the Sydney label M Squared. However, 'The Palcontents' never worked up to an actual release, and eventually I had to abandon such work for other commitments.

In the 2000s I finally had some time to resume musical creation. While engaging in relatively 'conventional' 'rock' music, I had side interests in 'experimental' work, often the creation of improvised soundtracks for old silent films. These—together with a longstanding interest in the 'xenotonal' music of people like Harry Partch—eventually led me to the Music and Sound Design faculty of the University of Technology Sydney. There I discovered the BP scale for the first time—I can no longer recall just how or where—and became intrigued by its potential for a new musical language. This doctoral exegesis is the result of a long process of labour in this area. It has been difficult and challenging in many ways. I hope my exposition of these challenges—and the concomitant rewards—will prove useful to others toiling in these rich new fields.

ABSTRACT

This work is a description of several years of intensive study into the Bohlen–Pierce (BP) scale, a tonal framework discovered in the early 1970s in which the scale is larger in compass than the conventional 12-tone-to-the-octave equally tempered (12–ET) scale. The BP scale repeats at the tritave—an interval larger than the octave—and all 13 notes within the tritave are either different in frequency to the 12–ET notes or used in different ways in different positions within the scale.

This difference, together with the fact that the scale is constructed entirely from odd-integer ratios of a fundamental frequency, where the 12–ET scale is based on tempered ratios of an almost entirely even-integer nature, poses many questions about both theoretical and practical approaches to the new scale. The ambit of this study has been to interrogate some of these questions through practice-based research with a view to answering the overall research question: 'Are there ways in which creative explorations of the Bohlen–Pierce scale can offer an effective context and/or impetus for the creation of new musical works ?'

The ultimate outcome of this process has been the production of a two-CD-length studio recording, *Plaksha—Authentic Music of the Ancient Laramidians*. This is the 'creative' component of the project. The exegesis is divided into five parts. Part 1, Chaos, examines the context and historical background of 'xenotonality'—making music in 'strange tunings'—and the BP scale in particular. Part 2, Discord, sets out the philosophy, objectives, boundaries and context of the study. Part 3, Confusion, describes the instruments I have built or adapted in the course of my study, and describes the construction, performance, and underlying assumptions of each of the seventeen music tracks which constitute the sonic component of this project. Part 4, Bureaucracy, reports on the outcomes of the study and attempts to weigh its ultimate value with a certain degree of objectivity. Part 5, Aftermath, consists of a summary and suggestions for further research.

INTRODUCTION

> A scientist, an artist, a citizen is not like a child who needs papa methodology and mama rationality to give him security and direction, he can take care of himself, for he is the inventor not only of laws, theories, pictures, plays, forms of music, ways of dealing with his fellow man, institutions, *but also entire world views, he is the inventor of entire forms of life.*
>
> Feyerabend, *Science in a Free Society*

Figure 1: Plaksha—*mock-up of 'CD cover'. (Original artwork, incorporating Martyniuk 2006)*

This exegesis exists to describe and to explain, somewhat, a body of musical works that I have been creating for the last few years. If these works were collected into a physical album of material, it would be called *Plaksha: Authentic Music of the Ancient Laramidians*. Nearly all of these terms require some deplication (vulgarly, 'unpacking') to be properly understood. 'Plaksha' is the Sanskrit name of the quasi-imaginary 'sunken continent', where the entirely imaginary society that produced the music was 'located'. The music is thus not 'authentic' in anything other than an ironically intended sense. Nevertheless, all of the pieces composing this project share a common property; without exception they are wholly or partially in some version of the Bohlen–Pierce (BP) scale. This scale, as the full title of the exegesis indicates, is the true subject of this study, and I will define and describe it in the forthcoming Part 1. 'Ancient' is also a term requiring definition; insofar as the imaginary 'inhabitants' of Plaksha ever 'existed', they did so at a time we regard as the Cretaceous Period (145–66 million years ago). They are here called the 'Laramidians' because the continent they inhabited—present-day North America—has, since 1996, been called 'Laramidia' by palæontologists attempting to describe it in its state at that time. Obviously, this implies that the Laramidians, although participants in a society or civilisation sophisticated enough to have evolved its own musical ethos—and one very different to anything in present-day human experience, at that!—were not likely to actually have been human. And, in fact, they were not human. They were both more and less than that.

Why this venture into the demiurgical—into world creation? Partly it is an inheritance from my own Honours study, in which many of the preoccupations of the current study were first established. Partly it is a framing and even a distancing device; the BP scale, first described in 1971, is a radically new approach to making music for which only a relative handful of works have been created so far. Even the very notes (to say nothing of the 'theory') no longer bear anything beyond a remote resemblance to those used in *any* system heretofore (although there is emerging evidence of a relationship between this system and the 12–ET one; see pp. 70-71 for discussion of a track, 'Kṛtrimakeśāvartī', which is in *both* of the systems at once). Such an 'alien' system invites, perhaps inevitably, the invocation of an 'alien' species to create and perform it. Partly it was simply for fun, although over the four years of this project, what seemed at first to be a tolerable 'joke' increasingly became a severely tedious burden to me. Nevertheless, I persisted, usually grimly, and I only

attempted to abandon the 'Laramidian' idiom once or twice. These occasions will be spoken of in their place.

I need to prepare the reader; what is ahead will, at times, depart from the structure of a conventional PhD dissertation. There is a growing body of work that suggests that this is a legitimate method of proceeding in a 'creative' exegesis. For the moment, the reader should know that what they will shortly encounter is in five parts. Part 1, Chaos, summarises the impetus towards 'xenotonality' in 'Western art music', and particularly describes the influence of Harry Partch (1901–1974) in this area. Xenotonality refers to music or tuning systems that are outside the common run of musical experience; I myself do not particularly care for this term, as it implies that the currently dominant 12–ET scale that finds a practical expression in a piano or synthesiser keyboard is a 'natural' or 'normal' form of musical expression to which everything else imaginable is 'foreign'. This is not necessarily so—and this is a subject that will be discussed at some length—but the term is in current use and is thus retained for convenience.

Part 1 continues with an account of the circumstances surrounding the initial articulation and expression of the BP scale in 1971 by its first discoverer, Heinz Bohlen (1935–2015). The subsequent and entirely separate rediscoveries of the scale by Kees van Prooijen in the mid-1970s and by Charles R. Pierce and his collaborators in the early 1980s are also described, along with the differing theoretical assumptions and practical expressions that each particular occasion brought to 'BP theory'. In fact, there *is* no overarching BP theory, at least at present, and the very different nature of BP to the 12–ET scale on a fundamental theoretical basis raises many questions that need to be answered if such a theory is ever to be articulated. Although an attempt to furnish such a theory was never within the scope of this project, some of these questions are necessarily touched on in the description that follows of BP research and practice to the present day. A description of some of the several different forms of BP notation that have so far been attempted concludes Part 1.

Part 2, Discord, attempts to place this theoretical material in the particular philosophical context of my practice in this project. For this reason, it opens with a somewhat general discussion of some relevant aspects of music theory. One major subject here is the 'right' or 'best' way for a 'xenotonalist' to proceed in these circumstances of '*tona incognita*'. Which—if any—assumptions of 'conventional' music theory are to be retained as useful in proceeding under these circumstances? There is a discussion of certain aspects of 'conventional' music theory in the xenotonal sense—particularly the 'tension' between the two philosophies of music articulated in ancient Greece by Pythagoras (c. 570 BCE–c. 495 BCE) and Aristoxenos (also Aristoxenus, c. 375 BCE–? BCE). Pythagoras' theory of strict just temperament, in which all musical intervals used were to be derived from small-integer ratios of a base tone, contrasts with the more flexible view of Aristoxenos, who insisted that the ear should be the arbiter of all musical decisions. But *whose* ear? Despite the raucous vehemence of Harry Partch in defence of just temperament, more modern research is presented that appears to lend significant support to the Aristoxenian view. I refuse to come down decisively on either side of the still-current argument, partly under the strong influence of the 'epistemological anarchism' of the 'iconoclastic' philosopher of science Paul Feyerabend (1924–1994), and partly under the also-strong influence of the 'Zetetic Pyrrhonism' of Sextus Empiricus (c. 160 BCE–c. 210 BCE), who wrote a stinging attack on all forms of dogmatic assurances in the form of a broadside called *Against the Professors*. One

book of this is called *Against the Musicians* (*Adversus Musicos*, Empiricus 1986), and it puts forward a series of arguments against *any and all* overarching 'theories' of music, as distinct from its practice. Some of these arguments are examined in the light of more contemporary guesses at theory.

The rest of Part 2 describes the context, objectives, background and boundaries of my study. It includes an account of my initial research in my previous Honours work. This was also in the BP scale, and it involved the construction and modification of some simple acoustic instruments (owing much to Partch's beautiful examples) and their use to sound all 45 of the then-known 'theoretical' modes of the BP scale—a mere handful of which had been experimented with up to that point. Part 2 then describes the early theoretical research in this doctoral project, in which dissatisfaction with the existing corpus of these modes (and the influence of Feyerabend) led me to step outside that tradition. Strongly influenced by Persian/Iranian classical music and a postulated general theory of 'Mediterranean tonality', I played with the chromatic BP scale until I stumbled upon an entirely new family of modes that disobeyed BP concepts derived from Western art music but that sounded irresistibly attractive to me, at least in monophonic and heterophonic practice. I called this family generally the 'Vathek Modes', and I then set out to create a body of creative works in variations of these modes. Many of these pieces interrogated theoretical concepts, but that was not necessarily the main impetus of the works; they were all intended to have merit as creative material in their own right as well.

Part 3, Confusion, is divided into two major parts; the first is a thumbnail description of the various BP instruments that I created for this project, as well as the various uses that I put (and did *not* put) them to. The second section of Part 3 is a description of the processes and practices which were followed in the course of making each of the seventeen tracks which comprise the sonic portion of the project.

Part 4, Bureaucracy, corresponds roughly to the 'discussion' phase of a conventional dissertation. An attempt is made to assess the outcomes of the project in terms of the research question and more general objectives. Implications of the findings are explored, both specifically as they relate to questions of BP 'theory' and, to a lesser extent, to 'music theory' more generally. Finally, in Part 5, Aftermath, a summary of the project and its findings is attempted, together with some suggestions for future research directions in light of what has been achieved so far. The curtain is then drawn on the whole process, still without many dogmatic 'conclusions' having been reached.

Appendix A follows, opening with a 'Discordian Disclaimer'. This takes its title partly from the 'parody religion' of Discordianism, which was originally a product of the hippie era of 1960s California but is now slowly working its way into more general cultural acceptance. Discordianism stresses adherence to the chaotic aspects of life, as personified in the Greek goddess Eris. (Discordianism's basic 'holy' text is known as *Principia Discordia* (Jackson et al. 1994).) The contrast between human attempts to impose order-as-structure onto the 'natural' phenomenological world

and that world itself, with all its erratic unquantifiability, is emphasised in Discordianism to the advantage of the latter, which is held to foster 'natural' creativity and humour.[4]

The reader is cautioned in the Discordian Disclaimer to not accept everything that follows in the remainder of the section as literal truth in the strict academic sense, but rather as a poetically 'true' account of the 'history' of the continent of Plaksha or Laramidia, as well as its inhabitants and their ways—particularly their music. A potted 'history' of Laramidia then follows, positioning its inhabitants as the 'Second Root Race' dreamed up by Madame Blavatsky (1831–1891), the founder of the Theosophical Society. (According to the anti-Darwinian Blavatsky, present-day humanity is the 'Fifth Root Race' of a total of seven such races—ours being the only human race in the conventional biological sense—that are destined to exist on Earth and every other inhabited planet such as Jupiter.) The 'Ascended Masters' are present-day immortal 'adepts' that inhabit an 'astral' city in the Himalayas and are invisible to normal eyes. These Ascended Masters, to whom Blavatsky attributed her voluminous and febrilous writings, are augmented by a new Ascended Master invoked especially for this project, one Jāgand Mara. Unfortunately, like his predecessors, he is far from being an entirely reliable narrator (and, unlike them, his personal life, his conduct and particularly his manners sadly leave much to be desired)!

This general 'account' of the Laramidians is then supplemented with an 'esoteric' description of the purpose and function of each musical track in Laramidian society based on material 'channelled' by Jāgand Mara. They are presented in 'chronological' order as exemplars of the three great divisions of the music of the three main islands that together comprised the continent of Laramidia. (This is not the chronological order of their actual creation.) The three islands were inhabited and abandoned in succession by the Laramidians, and the music—whether folk, courtly or sacred—of each island is somewhat distinct in its form, while still all being in the BP scale in one way or another. The music of the southern island, Suloma, is relatively 'primitive' in form, being that of the earliest stage of Laramidian culture. It is entirely equally tempered; the simplest possible form of the scale. The music of Sūrmi, the next inhabited island to the north, is more austere and complex in nature. It generally insists on just temperament and begins to use quarter tones. This proved to be such a controversial approach in its various forms (more than one of which is presented) that a civil war developed partly over this question, which devastated the continent and forced the scattered survivors to emigrate en masse to the main island of Praśāsitr. Here all forms of previous expression were synthesised, although again not without controversy. Other methods of tuning were also experimented with, despite the warnings of the elders that such rash reformism could only bring about a terrible, total and final calamity. And so it eventually did…

[4] This is also the source of the prefixes for each of the five parts of this document, which reflect the Discordian *weltanschauung* as per 'Dogma 1—Metaphysics #2, "Cosmology"' in pp. 44–45 of *Principia Discordia*.

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All illustrations in this document are the author's own work except where otherwise noted. Where relevant, the original image sources are listed in the captions. The use of all third-party images is in line with academic usage principles. Three of the illustrations (Figures 10, 54 and 55) which are credited in the text to the imaginary German Expressionist artist Ernst Yellam (1897-194?), are actually artwork of my own created (in some haste) after three illustrations did not receive copyright clearance in time to meet the submission deadline. The originals are cited here for reference. The significant likeness of J. R. "Bob" Dobbs (frontispiece and Figure 51) is a registered trade mark of the Church of the SubGenius (www.subgenius.com) and is used here by kind permission of Rev. Ivan Stang. PRABOB-FEITCTAJ.

GLOSSARY

All non-technical words—obscure or allegedly 'obsolete' as they may be—that are used here (other than the neologism 'fnord') may be found in the *Oxford English Dictionary*.

Fnord, *x*.	This word does not mean anything at all. It is sometimes employed as a metasyntactic variable, originally in the *Principia Discordia* and *The Book of the SubGenius*, but more recently by graffitists, EDM fans and computer programmers.
Just tempered, *adj*.	A musical interval (or array of such intervals) derived from small-integer ratios, in contradistinction to equally tempered intervals, scales etc., which alter the ratios slightly to achieve an equal acoustic distance across all intervals of a scale. It is also known as 'justly tempered', 'just intonation' etc., but here we will follow the usage of the *Oxford English Dictionary*.
Macrotone, *n*.	Any interval larger in span than a semitone.
Macrotonal, *adj*.	Usually used to describe a scale containing macrotonal intervals.
Microtone, *n*.	Any interval smaller in span than a semitone.
Microtonal, *adj*.	Usually used to describe a scale containing microtonal intervals.
Octave, *n*.	The repeating interval of the 12–ET scale. By definition, an interval of 12 semitones and therefore 1200 cents.
'Pataphysics (also Pataphysics), *n*.	The science and art of the epiphenomenology of metaphysics. A field of study originated by Alfred Jarry (1873–1907).
Practice-based research, *n*.	This exegesis will adopt the definition used by the Creativity and Cognition Studios at UTS, whereby the critical distinction between this project and one defined as practice-led research is that the outcome of this project includes a series of creative works in the assessable items (see Creativity and Cognition Studios, n.d.).
Semitone, *n*.	The basic material used to construct the 12–ET scale. By the definition of Helmholtz and Ellis ([1885] 1954, ftn p. 41), 100 'cents'. Twelve such intervals make up the 12–ET scale, which repeats at the 'octave'.
Tritave, *n*.	The repeating interval of the Bohlen–Pierce scale.
12–ET, *n*.	The twelve-tone-to-the-octave equally tempered scale, which is the basis of the vast majority of our present music. The keyboard of the piano or synthesizer is one of its practical expressions. It is also known as '12–TET' and 'the Western scale'—terms used interchangeably here.

Part 1: Chaos (The Impulse to Depart)

> I am chaos. I am the substance from which your artists and scientists build rhythms ... I am alive, and I tell you that you are free.
>
> *Principia Discordia*

> Without 'chaos', no knowledge.
> Feyerabend, *Against Method*

1.1 HISTORICAL BACKGROUND

1.1.1 On 'Xenotonality' Generally

The term 'xenotonality' can be taken to refer to any and all musical systems that stand outside the general run of music created within the twelve-toned equally tempered so-called 'Western' or '12–ET" scale (the latter term will be used henceforth for convenience). Despite the fact that nearly the entire corpus of 'Western art music' since the early nineteenth century has been created in this system, it is only one of many available to the creative artist. Even the advent of the electronic synthesizer in the 1950s did not offer as much ground for hope in new frontiers as it otherwise might have. Robert Moog harnessed the device to a piano-style keyboard which, with rare exceptions, has been the case to this day.[5] Still more unfortunately for those interested in exploring new sonic terrain, the adoption of the MIDI standard of synthesizer tuning in 1983 chained these instruments to 12–ET conceptually as well as physically, severely hampering their use for xenotonality when there was no real reason for doing so.

Naturally, music from other cultures was still being made in other ways—a set of approaches that was somewhat condescendingly confined to study under the rubric of 'comparative musicology' from the 1880s onwards—but these alternatives had little influence on the progress of art music in Europe in terms of tonality, with some notable exceptions. By the 1950s, serialism and total serialism were dominant, but even these forms of expression have their origins in the belief of the Second Viennese School that 12–ET was an depleted resource in conventional terms—while they seem to have had little thought of going beyond it altogether. Schönberg, Berg and Webern were all deep admirers of Wagner, so much so in fact that they believed his chromaticism had exhausted the conventional methods of composition. Schönberg voyaged from Romanticism in the 1900s to free atonality in the 1910s and finally to the tone-row and its four 'permissible' variations in the 1920s, telling an acolyte in 1921 (perhaps ironically) that he had 'discovered something which will ensure the

[5] The late Don Buchla (1937–2016) made an effort to avoid this outcome with his Kinesthetic Input Control Surface controller, which uses touchplates to transmit gestures from fingertips in contact with the surface. However, his designs, although roughly contemporary with Moog's, remained high-end systems with comparatively little market penetration.

supremacy of German music for the next hundred years'[6] (Hayes 1995, p. 148). Political events soon dictated otherwise…

In any case, even as 12–ET became established, there were signs of dissatisfaction with the system. Hermann von Helmholtz (1821–1894), the German polymath, published the first edition of his magisterial work *On the Sensations of Tone* in 1863. Helmholtz, a physicist among other things, made enormous strides towards putting music theory onto a more scientific basis. *Sensations of Tone* is generally regarded as a foundational work in psychoacoustics, and it has proven an abiding influence on xenotonalists and musicians in general. Helmholtz devoted the third part of the book to questions of 'Scales and Tonality' and included a discussion of questions of just and equal temperaments, concluding that the latter was by no means acoustically superior to the former, however compositionally convenient it might be in practice.

The 'ET' component of the term '12–ET' refers to the scale's equally tempered nature. This means that there is an acoustically equivalent interval in frequency (expressed by Alexander J. Ellis—Helmholtz' translator and a distinguished music theorist himself—as 'cents', where one cent is 1/100th of a semitone) between every one of the 12 notes of the octave (Stock 2007, p. 306). This in turn means that the notes are the 'same' as one repeats the scale through successive octaves. Transposing a tune between different keys always yields an agreeable result—providing one is willing to accept the tempering of these intervals. And yet, at least to some ears, these temperings are *not* particularly agreeable; the ultimate basis of the 'Western' scale is ancient Greek music theory as mediated by the Christian church in the Dark and Middle Ages, to a large extent by the influence of Boethius (c. 477 CE–525 CE) (see, for instance, Schrade 1947). Greek scales were based on small-integer ratios that generally underpinned their notion of consonance, partly for mystical or numerological reasons. Some people feel that these ratios yield more acoustically 'pure' results, although again this territory remains contested.[7] When 'Western art music' evolved to encompass polyphony, transposition and counterpoint, these acoustically pure intervals were 'tempered' into an acoustic equivalence which they did not previously possess, by changing the intervals slightly from their small-integer forms. When expressed as divisions of an octave, these ratio-based intervals are slightly inconsistent across multiple octaves, eventually leading (in just-tempered systems) to the unresolvable sonic paradox of the 'circle of fifths' not closing. If one marks out a circular pattern of ascension from a starting note by fifths, and proceeding through twelve successive steps of this sort, in 12–ET one will have ascended by 12 octaves and have returned to the same interval by pitch. This is not the case in just-tempered systems, and various systems of smaller subdivisions of semitones have been used to avoid the so-called 'wolf fifth', which results from the paradoxical fact that a just-tempered 'perfect fifth'—the frequency ratio 3/2—does not perfectly close this circle, being higher by about a quarter of a semitone.[8]

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[6] Aside from the priority of invention of the tone-row concept by Josef Matthias Hauer (1883–1959), see Todd (1978) for an attribution of the earlier use of the four 'permissible' permutations of a cantus firmus (the firmus itself, its inversion and both of these retrograde) in the works of Jacob Obrecht (1457/8–1505).

[7] 'Words such as clarity, purity, smoothness and stability come readily to mind' (Doty 2002, p. 1).

[8] The BP scale also presents the same sort of paradox, but I cannot say that it has occupied the forefront of my consideration, partly due to the smaller difference between just-tempered and equally tempered versions of the BP scale as distinct from 12–ET (noted throughout this document), and partly due to philosophical considerations of the arbitrariness of *all* schemes of temperaments, as discussed in greater depth in Section 2.1 and Parts IV and V.

At any rate, as already noted, there was an impulse to venture outside these rather arbitrary boundaries from the nineteenth century. Helmholtz took note of the keyboard experiments of R. H. M. Bonasquet (1841–1912), who designed a number of 'universal keyboards' that could be used in a variety of tunings, including a system that divided the octave into 53 equally tempered intervals (53-ET). In 1895, the Mexican composer Julián Carrillo (1875–1965) was experimenting with his violin when he realised that there was no particular reason to stop subdividing the string at semitone intervals. He divided the semitone into 16 equal microtonal intervals (where a 'microtone' is any interval less than a semitone), and from these experiments derived a microtonal system that he called 'Sonido 13' or 'Thirteenth Sound' (Benjamin 1967). Carrillo consequently predicted the advent of a new, transformative age of music that has largely failed to come about to date (although there are some signs of a recent resurgence of interest in his theories).[9]

Around this time, a young Percy Grainger (1882–1961) was lying in a boat in Albert Park in Melbourne, musing on the patterns of undulation that the waves made as they lapped against the sides of the boat. He wondered why music could not be made in this way. Despite his success as a concert pianist and composer of light music, he spent most of the second half of his life trying to create his 'Free Music' as a practical reality; one that he defined this way in 1942: 'In Free Music there are no scales—the melodic lines may glide from & to any depths & heights of (practical) tonal space, just as they may hover about any "note" without ever alighting upon it …' (Balough 1982, cited in Linz 2003, para. 4). In some ways this is still more 'radical' than xenotonality; Grainger was seeking to abrogate all set tonal relations entirely. With the aid of the physicist Burnett Cross, he built intricate quasi-electronic machines to play his gliding scores on rolls of meticulously cut cardboard. Grainger said that 'it is the goal that all music is clearly heading for now and has been heading for through the centuries. It seems to me the only music logically suitable to a scientific age' (Crab 2016, para. 6).

Also at this time, Charles Ives (1874–1954) was embarking on his own impulse to 'stretch our ears and strengthen our musical minds' (Ives 1991, p. 115).[10] His innovations in polyrhythm and polytonality are now fairly well known; his Fourth Symphony (c. 1910–1920?) also employs quarter tones. His approximate contemporary, the Czech composer Alois Hába (1893–1973) was also employing these intervals and smaller ones at around the same time (Whitman 1967). And while one might mention quite a number of other pioneers—many of them sadly neglected today, such as Australia's Elise Hamilton (1888–1965) (Goh 2014)—a lack of space and time forfend detail.[11] However, it is certainly necessary to consider the life and work of Harry Partch (1901–1974), who was regarded by many as a giant of twentieth-century xenotonalism.

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[9] Persian, Arabic, Byzantine, Indian and other so-called 'world musics' have always used this sort of microtonal interval, but here we are considering the effect of this thinking on Western art music.

[10] Ives was actually referring to the practice of his father, a band leader, teaching Ives and his brother polytonality as children by having them play a popular song on the piano with the melody and accompaniment in different keys. Nevertheless, the practice was one of Ives' signature methods in his maturity, and the phrase is a neat encapsulation of his overall intentions.

[11] See Brian McLaren's 'A brief history of microtonality in the twentieth century' from *Xenharmonikon* 17 (Spring 1998), pp. 57–110 for a useful overview.

1.1.2 Harry Partch: 'Seduced into Carpentry'

Partch was born in rural Arizona to lapsed Presbyterian missionaries who had returned from China. Mandarin was read and spoken (and sung) in the family household, and Partch taught himself to play a variety of conventional instruments that were delivered to the family's isolated ranch by mail order. Local Native American and Mexican musics were another strong influence. Partch moved to Los Angeles in the 1920s and spent two years at the University of California's School of Music as a student pianist—an experience he was to spend the rest of his life downplaying and dismissing. His book, *Genesis of a Music* (first published in 1949), contains philippics of this sort: 'As things now stand the intonation which the individual composer desires … is left to the fingers of the violinist, the lips of the flautist, and the laps of the gods—all tender mercies, we hope—simply because of the iniquitous determination of musical education to withhold from students any adequate comprehension of the problems of intonation' (Partch [1974] 1979, p. 424).

Yet a statement is not untrue merely because it is a philippic. Partch, at any rate, was not satisfied by his conservatory education. He quit and embarked on a process of self-education that began with *Sensations of Tone* and extended through a survey of historical intonation. In 1930, he burned all of his earlier compositions and began again. The result of these labours was a microtonal and just-tempered system for which no scores or instruments existed. Partch began creating these himself, working under conditions of extreme poverty and often using recovered and recycled materials. A period spent homeless during the Great Depression was finally relieved by a Guggenheim Fellowship in 1943, and Partch began to create recordings and train ensembles to perform his music.

These activities, together with the construction of further instruments, occupied the rest of Partch's life. Inevitably his deliberately visually arresting instruments attracted as much interest as his theories on tuning, if not more. Partch protested vainly (and somewhat disingenuously) that he was not primarily an instrument-maker, but rather 'a philosophic music-man seduced into carpentry' (Gilmore 1998, p. 260). But he also did himself no favours by adopting an expostulatory style so magniloquent and opaque that one sometimes wishes, as Byron did of Coleridge, that Partch would 'explain his explanation'. His stentorian conclamations against the musical establishment of his day—on the periphery of which he dwelt in ever-penurious and often spiteful dependency—predictably resulted in his being passed over for tenured positions on music faculties, most of which, he snorted, merely offered degrees from 'Bachelor of Bach' to 'B. V. D.—Bach verus Dominus, requiring that the candidate rewrite the entire *B minor Mass* from memory under massive doses of injections of pentathol' (Gilmore 1998, p. 171).

Since Partch's death, the more popular musical establishment, at least, has taken a degree of interest in his theories: witness a performance of his 1941 work *Barstow*, rearranged for strings, by the Kronos Quartet, as well as influences on the music of Tom Waits and the inclusion of some of his instruments on an album by Paul Simon in 2016.[12] Whereas these latter two artists sought to adapt Partch to conventional tuning, in 2009 the pop/hip hop artist Beck Hanson released a tribute song

[12] A member of one of Waits' backing groups, the multi-instrumentalist Francis Thumm, is also a former member of the Partch Ensemble (San Diego State University 2017).

that was purportedly in Partch's preferred tuning (although I must admit to some difficulty perceiving it myself) (Hanson 2009).

For Partch, however, any equally tempered music was decisively out of tune in the most literal and far-reaching sense (even though, paradoxically, he integrated his instruments with conventional ones in works like *Revelation in the Courthouse Park* (1960/61)). Partch was a dogmatic just temperamentistist and also—while a great xenotonal pioneer—a microtonalist rather than a macrotonalist. He never strayed outside the compass of the octave as a repeating interval—or the '2/1 ratio' as Partch insisted on calling it, as he rejected note names as confusing, perhaps with some justice. The idea of a macrotonal scale with a repeating interval larger than the octave appears not to have occurred to him, perhaps partly because, despite some intriguing hints in *Sensations of Tone*, it appears that Helmholtz never spelled out the possibility.[13] (Or if it did occur to Partch, I know of no record of his taking an interest in it—see also the further discussion on p.74.) Partch died in 1974 without (as far as I know) ever hearing of the research and assumptions that underpin the BP scale. Just as there is no compelling evidence to suggest that every aspect of conventional music theory necessarily applies to BP, there is none to suggest that Partch's theories necessarily apply either. In fact, I have gone against his key dictum of the supremacy of just temperament, because in places I am presently using BP in its equally tempered form.

1.2 THE BOHLEN–PIERCE SCALE

1.2.1 Origins

In 1971, a German electronics engineer, Heinz Bohlen, volunteered to serve as a recording engineer for a Hamburg music school. The formally untrained but intellectually curious Bohlen supervised the recording of student performances of pieces that ranged over a millennium, from plainchant to hyperserialism. It seemed to Bohlen—an expert in frequencies through his profession (he specialised in the design of telecommunications systems)—that the works he was recording were all, despite their other properties, expressed in effectively the same mathematical system: 'Whatever I had to deal with … it could finally be reduced to consist of 12 tone steps, filling the compass of an octave!' (Bohlen 2010, para. 13).

This aroused his curiosity, and he began to ask the teachers why, 'with a universe of pitch steps available' (para. 14), an entire culture of the most scrupulously trained musicians was only using one particular instance of them. Bohlen received no satisfying answers, so he embarked on his own course of research.

Eventually Bohlen was led to a series of postulates that informed his subsequent thinking. The first was that an exponential function in the form $f_n/f_0=K^{n/s}$ is a necessary precondition for what he called 'natural euphony' (para. 20). In this expression, f_n is the particular pitch at the nth step of the scale, f_0 is the root note of the scale, K is the repeating interval and n is the total number of steps within

[13] See Helmholtz (1885) 1954, pp. 187–188, p. 194, p. 254.

the repeating interval. (As an illustration, the 12–ET scale satisfies this condition, and in these terms is expressed as $f_n/f_0=2^{n/12}$.) The discovery of this 'irrational' approach has been variously attributed to theorists ranging from Ancient China to seventeenth-century France.[14]

This primary condition—Bohlen called it the 'principle of equidistance'—was justified with reference to the exponential frequency sensitivity of the organ of Corti, a natural transducer that is part of the human cochlea. It transforms mechanical movement of the tympanic membrane (via a mediating path) into electrical neural signals passing into the auditory cortex.[15] Bohlen experimented with tone generators and found that many of the scales producible by these means were not 'harmonic' in the sense that he desired. Further information was needed.

It was found when a faculty member recommended Paul Hindemith's (1895–1963) *Unterweisung im Tonsatz* to Bohlen. This work, translated in English as *The Craft of Musical Composition*, is an encapsulation of Hindemith's musical thinking in the 1930s, the middle of his politically torturous life.[16] Hindemith's exposition of combination tone theory inclined Bohlen towards his next step. As expressed by Hindemith, combination tones are different from harmonics or overtones, which are integer-multiple frequencies of a given tone sounded on a complex instrument. Combination tones are produced when 'a stringed instrument plays a double stop, or two bassoons play together, or simultaneous groups of tones are produced in any other way' (Hindemith 1945, p. 58). Hindemith believes that 'they are usually so weak that the superficial ear does not perceive them, but this makes them all the more important for the subconscious ear' (p. 58).

According to Hindemith, these tones are of crucial importance to music theory, but they have been neglected since their discovery in the seventeenth century because of their subtlety in practical expression. Hindemith exploited the variability of the newly discovered tone generators to produce sliding tones, which enabled him to produce charts of combination tones throughout the 12–ET system, within which, very broadly speaking, Hindemith was content to remain.

Building upon the work of Hindemith, Bohlen charted an array of just-tempered intervals that were in consonance with the combination tones they created when sounded together. Bohlen constructed the conventional (meaning the 12-toned, 2/1 repeating) just-tempered chromatic scale from these intervals (plus some extrapolations 'following given examples' (Bohlen 2010, para. 32) and further generalised that 'all just intervals known as consonant shared this feature of consonance with their related combination tones' (para 31). He referred to this as his 'principle of consonance'.

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[14] See, for instance, the discussion of the possible primacy of the discovery by Simon Stevin (1548–1620) on p. 172 of Lindley (1980).

[15] Just what hearing really *is*, of course, remains a profound mystery, and subject to Paul Feyerabend's caution regarding the neglect of the psychological component of the process of seeing, as expressed in his extended discussion of telescopic observations in chapters 10–12 of *Against Method* (Feyerabend 1975). (And, as we see here, Hindemith speaks of 'the subconscious ear'.)

[16] Despite his various attempts to reach enough of an accommodation with the Nazis to be able to continue working, a copy of the original German version of Hindemith's book was displayed behind glass along with Schönberg's *Harmonielehre* at the 'Degenerate Music' exhibition in Düsseldorf in May 1938 (1937 according to Forte). (Hindemith had already prudently emigrated.) (Forte 1998, p. 3.)

The conventional expression of the scale fitted these principles, but did other scales also fit? The conventional just-tempered scale could be derived from combination tones with only squared or 'even-order' elements, other than the 'major sixth' of 5/3. (Even-order means that when two frequencies, f_1 and f_2, are combined in various manners to produce combination tones, the sum of the coefficient is always even, as in these examples given by Bohlen: $2f_1$, f_2-f_1, $3f_1-f_2$.) If one considers instead the odd-order elements ($3f_1$, $2f_2-f_1$, $4f_1-f_2$), a different perspective emerges.

Bohlen had already ranked all 20 intervals he assessed as consonant in his combination tone theory by degree; obviously the unison, 1/1, was the most consonant. As conventional music theory implies, the octave, 2/1, was the next most consonant, but directly after that was the interval 3/1, unused in conventional music except occasionally as the interval known as the 'twelfth'.

Taking the 'major sixth' interval of 5/3, which was clearly odd-order, and its foundation in the unison 1/1, Bohlen extrapolated from 12–ET triadic theory to make 7/3 the upper member of a consonant triad 'that has its foundation in odd-order non-linearity as clearly as the major triad is based on even-order non-linearity' (Bohlen 2001, p. 621). The highly consonant odd-order 3/1 as the framing interval of a new scale followed with near inevitability. It was immediately apparent that a radically new way of making music was at hand:

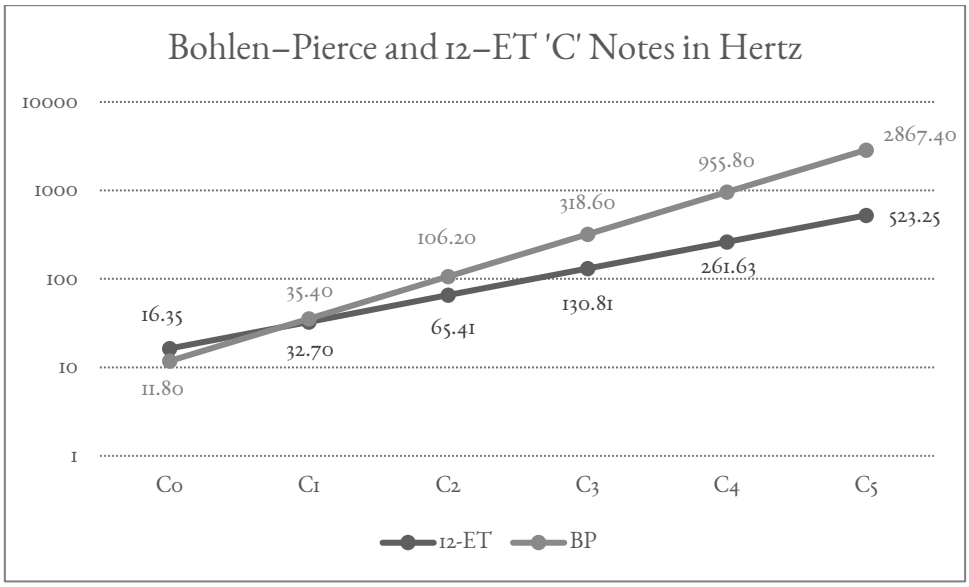

Figure 2: A comparative chart of 'C' notes in the BP scale and in standard orchestral 12–ET tuning (where the BP tuning is set to Bohlen's standard BP E2 = 12–ET A1 at 82.41 Hz (as given in Huygens–Fokker 2011, para. 3)).

1.2.2 Great Minds Think (Somewhat) Alike

Bohlen's process of discovery has been followed thus far for a simple reason; to paraphrase Coleridge, Heinz Bohlen 'was the first that ever burst into this sonic sea', and his reasons for doing so are worthy of attention. They also raise questions about some assumptions of music theory that have cogency today. Neither combination tone theory nor Bohlen's use of it to derive the scale are uncontested; as for the theories of 'consonance' and 'dissonance' in toto, an expert reviewer will doubtless be even more aware than this author of the seemingly perpetual state of flux in which these matters exist and will probably always exist.

Bohlen modified an electronic organ to play the scale in 1972. He published a key paper, '13 Tone Steps in the Twelfth', in a German acoustical journal in 1978, which summarised his findings (referenced here in translation as Bohlen 2001). Professional commitments thereafter largely kept him from involvement in xenotonality.

The Dutch musicologist Kees van Prooijen independently repeated Bohlen's discoveries in 1978 in the paper, 'A Theory of Equal-Tempered Scales'. Operating from a process of calculation of theoretical equally tempered scales through continued fractions, van Prooijen expressed the scale as one in a range of possibilities. Van Prooijen's approach was expressed rather differently to Bohlen's. Given Bohlen's reference chromatic just-tempered BP scale thus:

Step	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Ratio	1/1	27/25	25/21	9/7	7/5	75/49	5/3	9/5	49/25	15/7	7/3	63/25	25/9	3/1

Table 1: Chromatic BP Scale.

Bohlen derived a set of nine-tone diatonic modes consisting of two pentachords divided by a tone; for instance, the Lambda mode:

Step	0		1	2	3		4	5		6	7		8	9
Ratio	1/1		25/21	9/7	7/5		5/3	9/5		15/7	7/3		25/9	3/1

Table 2: BP Scale, Lambda Mode.

Van Prooijen attempted a closer parallel to traditional musical theory by creating two seven-tone scales that contain three-step intervals and are characterised as 'major' and 'minor'. Thus (note that van Prooijen also chose some different ratios to those employed by Bohlen), for his major mode (van Prooijen n.d., para 8), he articulated several forms of each scale:

Step	0			1	2		3	4			5		6	7
Ratio	1/1			35/27	7/5		5/3	9/5			7/3		25/9	3/1

Table 3: Van Prooijen's Major Scale.

This is a matter that will have practical consequences for this study, as will be shown later.

1.2.3 Enter Pierce

Bohlen's and van Prooijen's work attracted only a small amount of attention. Bohlen originally published in German and was unaware in those pre-internet days of the wider xenotonal community, which in turn remained unaware of his revolutionary findings. Van Prooijen's paper attracted more attention as a work in scale theory than as a practical proposal for a tuning system. Both men largely retired from active work in this field, and their contributions were effectively forgotten at the time.

In the early 1980s, the distinguished American electronics engineer John Robinson Pierce (1910–2002) retired from a long and impressive academic and industrial career. He attended the Center for Computer Research in Music and Acoustics at Stanford University, and working with Max Mathews (1926–2011) and others, he continued his research in computer music as Visiting Professor of Music, Emeritus.

In a 1992 interview with a writer for the Center for the History of Electrical Engineering, Pierce recalled that, at the time, Mathews (in whose memory the Max/MSP audio programming language was partly named, and who had worked with Pierce at Bell Labs, including on early computer music in the late 1950s) was conducting psychoacoustic comparisons of just- and equal-tempered triads. Mathews observed a division in preferences between the two forms of expression, and he wondered whether this would continue across triads in exotic scales. To test this, Mathews constructed triads out of the 3:5:7 and 5:7:9 frequency ratios and found that the tendency persisted. Upon exposure to these triads, Pierce asked Mathews: 'couldn't a scale be made out of these tones?' (Goldstein 2015, para. 80). Indeed it could …

A number of papers emerged from the work of Pierce, Mathews and others. These are summarised in a chapter by Mathews and Pierce in the book *Current Directions in Computer Music Research*, published by the MIT Press in 1989. This restates the starting point of the work of Mathews, Roberts et al. in intonation sensitivity, observes the greater faithfulness of tempered BP intervals to their just BP counterparts, and notes that 'for tones with odd harmonics only, the tritave plays the role that the octave does for tones with both even and odd harmonics' (Mathews & Pierce 1991, p. 168). The authors noted the different evaluations of relatively 'consonant' chords made up from different degrees of the BP scale by trained and untrained listeners, and they speculated that 'musicians are much influenced by their training with and listening to the diatonic scale—and by their lack of training with or listening to the BP scale' (p. 171). Bearing in mind that the BP scale was in its infancy and that only 'a small number of short pieces have been composed using the scale', Mathews and Pierce provisionally noted that 'it is possible to produce clear and memorable melodies in the scale' and that 'counterpoint sounds all right' (p. 172). They observed that 'chordal passages sound like harmony, but without any great tension or sense of resolution' (p. 173). (Incidentally, Pierce was dismissive of Bohlen's earlier work, referring to him as 'some German' (Goldstein 2015, para. 80) and admitting that he had not read Bohlen's paper (which is nevertheless cited in *Current Directions*), but 'had somebody read it to [him] in English', which gave Pierce the impression that Bohlen 'was investigating other things' (para. 80). In this lengthy interview from the early 1990s, Pierce refers to the system exclusively as 'the Pierce scale'…)

1.3 BOHLEN–PIERCE MUSIC TODAY

Theory helps us to bear our ignorance of fact.
Santanyana, *The Sense of Beauty*

1.3.1 Further into the Unknown

Following the work of Pierce, Mathews and Roberts et al., the scale acquired some more general notice, perhaps due partly to the English language and wider distribution of their papers compared with those of Bohlen and van Prooijen. Some pioneering xenotonalists began to work with the scale; for example, Professor Richard Boulanger used Mathews' 'Radio Baton' instrument to write the piece 'Solemn Song for Evening' in 1987. It was becoming apparent that the BP scale had musical potential in its own right, and that it was something more than a psychoacoustic curiosity.

Boulanger's student Elaine Walker contributed some memorable songs, as well as significant research. In 2001, as part of her master's degree, Walker extended the corpus of BP modes from the families previously enunciated by Bohlen, all of which consisted of two pentachords that each spanned six BP semitones and were separated by a half tone. Walker proposed three new families of modes that consisted of two unequal pentachords, one of six semitones' span and the other of five, separated by a whole BP tone (Walker 2010, p. 41). This move into unknown territory established a total set of 45 BP modes of the types expressed by Bohlen, Pierce et al. and Walker. These modes have in common the avoidance of any scale step larger than a whole tone—it should be remembered that van Prooijen did not limit his scales in this way. Nevertheless, the architecture conceived of by these three experimenting parties has become the de facto 'standard' of BP expression, and most, if not all, of the BP pieces produced so far seem to be content to abide within it.

The question of timbre within BP composition was realised to be of significance by Bohlen himself, who after all had knowingly designed a scale that expressed odd harmonics. Bohlen created an experimental instrument in 1972 that was an electronic organ with a modified keyboard, and he used square waves in its output because of their exclusively odd-harmonic composition. Whether BP music demands the use of instruments with a preferentially odd-harmonic timbre is a matter of much debate even today. Bohlen and Pierce clearly thought that it did, and partly for that reason, the early BP compositions were created on synthesizers forced into xenotonality by various means. However, the composer Georg Hajdu (1960–) realised while working with the BP scale in the early 2000s that the clarinet, almost uniquely to orchestral instruments, has an odd-harmonic timbre throughout most of its range and actually overblows at the 12–ET twelfth, which is also our tritave. Consequently, a dedicated BP clarinet was created in 2007 by Stephen Fox and has been used with excellent results, most notably by Nora-Louise Müller (2010). This achievement seemed to open conceptual floodgates, and a number of non-synthetic BP instruments resulted—particularly guitars refretted to express BP, usually in its equally tempered form. One such guitar—a Hohner acoustic refretted by Bohlen in 1997—suggested that more complex timbres might be capable of expressing BP well.

Bohlen's observation serves to underline a key point in my own research; in his far-reaching work on musical theory, *Tuning, Timbre, Spectrum, Scale*, William Sethares concluded a brief exposition of the BP scale thus: 'the Bohlen–Pierce scale really is fundamentally different, and it requires a

fundamentally new music theory … this theory is not trivial or obvious' (Sethares 2005, p. 112). Sethares' perspective relies on computer-generated 'dissonance curves' (explained in Chapter 6.1 of his book). These are graphs of comparative dissonance derived from the work of psychoacousticians such as Helmholtz, Plomp and Levelt, but created with reference to a particular spectrum or set of harmonics. Where these dissonance curves have a minimum value, and therefore the most 'consonance', is a likely place for a scale note to occur. When Sethares 'stretched' a 12–ET scale so that it repeated at the tritave, for a dissonance curve calculated for odd harmonics, the minima of the 'stretched' scale did not coincide with the 'stretched' scale steps, but they did coincide with the BP scale steps. Bohlen already noted in his 1978 paper that there was 'a certain duality between both systems that is defined by the choice of the basic intervals' (Bohlen 2001, p. 624). While this permits the transposition of music between the two systems, it is by no means certain that the *theory* transposes as easily or as thoroughly. That is partly what is being investigated!

1.3.2 On 'Theory' in a Vacuum

Regarding this congruence or otherwise with conventional music theory, the main BP website puts the matter this way: 'All three discoverers of "Bohlen–Pierce" were on the same quest, looking for harmony and specifically tonality outside the well-trodden path of the Western musical system' (Huygens–Fokker Foundation 2009, para. 23). In a short discussion of the scale in his book *Music: A Mathematical Offering*, Professor David Benson suggested that 'it is plausible that proper appreciation of music written in the BP scale would involve learning to "forget" the accumulated experience of the perpetual bombardment by octave based music which we receive from the world around us, even if we are not musicians. For this reason, it seems unlikely that such music will become popular' (Benson 2008, p. 227). One may wonder whether a music that can best be apprehended by 'forgetting' the precepts of conventional music theory will necessarily be best served by imposing them on it. In fact, I am more inclined to think that 'the best way to proceed in such circumstances is to use examples which are outside the range of the routine responses' (Feyerabend 1975, p. 230).

For example, it is often suggested that because of the scale's derivation from exclusively odd-numbered small-integer ratios, instruments that prefer odd harmonics in their timbres (such as the clarinet, broadly speaking) would be 'better' for BP. Sethares' results imply as much. Yet, as we have seen, Bohlen himself produced results that seem to suggest otherwise. This is very much a field in flux, and although psychoacoustics can be of great assistance in taking tentative steps forward, it is less certain that the results accrued in studying 12–ET can be as useful.

In 1987, Pierce and Mathews made an ultimately unsuccessful application for funding from the National Science Foundation to further their studies of the new scale. In this document, preserved on the BP website, the authors stated that the scale has 'a rich structure of keys which is comparable in complexity to those of the diatonic scale, but completely different in detail' (Mathews & Pierce 1987, p. 2). While noting that certain psychoacoustical concepts are common to BP and 12–ET, Pierce and Mathews felt that 'these scales are unique stimuli with which to study learning of higher-level concepts because subjects exist who have no previous exposure to the scales' (p. 2).[17] In fact, Pierce and Mathews were prophetic—precisely this cognitive novelty of BP has been noticed and is now

[17] One of the general common concepts is that, where the 12–ET scale can be generated by multiplying a starting frequency by $\sqrt[12]{2}$ (~1.059463) in 11 successive steps of 100 cents, the equally tempered BP scale can be generated by multiplying a starting frequency by $\sqrt[13]{3}$ (~1.088182) in 12 successive steps of 146.3… cents.

being used in cognitive science.[18] It is these aspects that have informed and guided my research, as will be described.

1.4 THE NEED FOR THIS STUDY

1.4.1 Some Precursors

The influence of various 'Western art' composers on this project has already been noted. However, these relate more to the broader xenotonal impulse and, as particularly noted in the case of Harry Partch, while there might be stylistic or idiomatic congruences, the relevancy to any compositional effort in BP would be extremely general at best.

As for BP music in particular, its total history stretches back to Bohlen's construction of a modified electronic organ to test his theories in 1972. This instrument still exists today, but although Bohlen wrote some material for it, it appears that none of it was recorded prior to his death in 2015 (or at least no recordings have survived). Similarly, van Prooijen's research was more theoretical than practical, and although he has now written some pieces in his particular expression of the scale, they were created comparatively recently.

Pierce was less of a practical musician than a theoretician, and although he and Mathews (and their collaborators such as Linda Roberts) created some pieces to test their theories, they were not intended for creative purposes as much as to ascertain that, as already mentioned (p.9), 'it seems possible to produce clear and memorable melodies in the BP scale. Counterpoint sounds all right' (Mathews & Pierce 1991, p. 172). They also noted that a number of short pieces have been composed in the scale, examples of which were included in a CD attached to the book, regarding which 'the musical interest of these compositions must be judged by the listener'[19] (p. 172).

The initial assumption that odd-based harmonic timbres were preferable in BP led to an assumption that the digital computer instruments and applications arising in the 1980s and 1990s would be desirable for the expression of practical BP music (although outside of timbral issues, any fretless instrument such as the violin can be adapted to the scale by a simple retuning). Progress was summarised in the first (and so far only) Bohlen–Pierce Symposium, which was held in Boston in 2010. Bohlen's own contribution to this conference has already been cited, but other pioneers in the field also attended and presented, and some of their experiences seem germane.

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[18] For example, Durrant et al. 2011, 'Sleep-dependant consolidation of statistical learning', *Neuropsychologia* 49, pp. 1322–1331, Smit et al. (2019), 'Perception of affect in unfamiliar musical chords', PLoS ONE 14(6): e0218570. https://doi.org/10.1371/journal.pone.0218570.

[19] One of the pieces, 'Eros Ex Machina', is by Jon Appleton (1939–), co-creator of the Synclavier, an early digital synthesiser and sampler used by Frank Zappa among other luminaries. In its resurrected 'virtual' form as the Arturia Synclavier V, it has also been used on some of the recordings accompanying this exegesis.

The German composer Georg Hajdu contributed a paper, 'Starting Over—Chances Afforded by a New Scale', co-written with Müller and Konstantine Orladatou. (This later became a chapter in the book *1001 Microtones*, which is the reference used here.) Hajdu began working with the scale in 1991 and used it in a scene in his opera, *Der Sprung—Beschreibung einer Oper* (*The Leap: Description of an Opera*), in 1994. (Hajdu also reported teaching the world's first unit in BP theory and ear training at his institute, the Hochschule für Musik und Theater Hamburg, but it does not appear to be offered at present.) As the paper stated: 'we are attempting to artificially (re)construct a situation analogous to the long development of Western music, the result of centuries of trial and error codified by generations of theorists. Doing the same with the BP scale means going back in time and *arbitrarily choosing* a historic template from which to model our analogies' (Müller, Orlandatu & Hajdu 2014, p. 128, my emphasis). In fact, one might choose all forms of practice from all ranges of 'Western art music' from 'Palestrina or Bach counterpoint' to 'compositions in the tradition of the French spectralists' (p. 128). Alternatively, one might seek such a template—as a starting point only—right outside these traditions, as I have done.

Curtis Roads' paper 'Composing *Purity*' (emphasis in original) is of particular interest as an exploration of the practical process of creating pieces in BP. Roads (1991, p. 12) reported responding to the practical limitations of his weapon of choice at the time, the Korg M1 synthesizer, as its tuning is octave-based. This means that remapping an otherwise retunable keyboard in this system to BP intervals will not create consistency over the repeating interval of BP, the tritave, larger than the octave. Roads solved this problem in practice by splitting the keyboard into different portions of the BP tritave within different octaves and resigning himself to repeatedly retuning and overdubbing to create the final work. This is an approach that, after considerable effort, I have stumbled on independently for my own final work, as will be described. (I wish I had read Roads' paper more attentively instead of laboriously rediscovering his approach for myself!)

Elaine Walker spoke of the question of BP inversions. Triads are not reliably recognised as identical in their inverted form by either naïve or trained listeners. This touched on the issue that I have referred to, informally, as 'The Ouch Factor', in which aspects of BP such as this 'inversion problem' and the similarity of a few BP intervals to 12–ET ones can contribute to the perception of BP as being simply 'out-of-tune 12–ET'. This perception seems to become stronger, in most cases, with the degree of exposure to Western art music. Much of my own research has been directed towards overcoming this perceptual barrier; I venture to assert some tentative success, as will be described in Part 4. Walker, for her own part, asserted that 'after listening to tonal Bohlen–Pierce music for quite some time, and playing around with chords, I naturally started hearing inversions'. She added: 'I also now hear the tritave take on the function of an octave!' (Walker 2010, p. 9). I can only add that while my studies so far have not been particularly chordal, in terms of the tritave my experience is the same.

Walker presented some music that she felt provided cadences with the sense of 'finality' that Pierce and Mathews experienced as missing from their early efforts. She published her results in research into the initially expressed BP modes, adding the ones that have become known by her name. In correspondence with Bohlen in 2001, Walker recorded this comment of Bohlen's on the inversion question: 'I am delighted to see that no similarity has been found. I personally never believed in them; I think even in our 12-step Western system it is a kind of cultural deception that we perceive similarities in inverted chords' (Walker 2010, p. 35).

In 2010, Amy Advocat produced what is, as far as I am presently aware, the first doctoral-level study of the scale, *A New Tonal World: The Bohlen–Pierce Scale*. Unfortunately, I did not have the chance to read it until after the first draft of this exegesis was already complete—too late for it to have a significant effect on my own work. Advocat is a clarinettist, and her thesis included BP clarinet works that were premiered at the Bohlen–Pierce Symposium in 2010. Her literature survey naturally overlaps with mine, but with some notable distinctions; for instance, she explored Hajdu's choice of some even-integer ratios in his own expression of the scale (Advocat 2010, pp. 27–29) and proceeded from there to investigate differing approximations of just-tempered BP ratios achieved via the process of continued fractions—van Prooijen's original impetus (pp. 28–33).

Advocat was rather more concerned with BP harmonic theory than I have been, perhaps partly because of her perspective from within 'Western art music'. She also thought that odd-order timbres might 'make it easier to hear the tritave as the interval of equivalence' (p. 53), and 'a return to simpler language in a new scale might be the best possible way to explore its harmonic capabilities' (p. 61). In pursuit of this 'simpler language', Advocat offered an analysis of Bohlen's 1973 transposition into BP of a very old German carol, 'Es Kommt Ein Schiff Geladen' (pp. 62–65). In this, Advocat said that Bohlen 'takes the listener from the home key to a modulation to a "dominant" and then back home with a very strong final cadence' (p. 65).[20] This structure, Advocat said, is probably deliberate because 'Bohlen's aims at finding a new scale were to find one that had the harmonic qualities analogous to the current musical system' (p. 65). Advocat contrasted this with Walker's songs, which 'were all written exclusively by ear and do not follow any specific set of harmonic rules' (p. 65).

Advocat offered a very useful analysis of some other pieces, but for further information the interested reader is referred to her own dissertation, as this exegesis is already more than long and detailed enough.

1.4.2 To the Present

While many areas of BP can be informed by 'Western' music theory, here, as Sethares noted, we are dealing with a fundamentally new area of knowledge, and one in which, fascinatingly, even the basics seem to be in an embryonic state. Areas of psychoacoustics, music cognition and the philosophy of music enter into play, much as I have been advised to 'not do *two* exegeses' by leaving them in. But Feyerabend noted in *Against Method* that '*Discovery* may be irrational and need not follow any recognized method … *Criticism* … starts only *after* the discoveries have been made, and it proceeds in an orderly way' (Feyerabend 1975, p. 165, emphasis in original). He also pointed out—and in my view this is crucial—that '*learning* does not go from observation to theory but always involves both elements. Experience arises *together* with theoretical assumptions *not* before them' (p. 168, emphasis in original).

This has been so true, and so characteristic, of my own small struggles to understand my material in several workable ways at once that it is time now to demonstrate this in practice by turning to an

[20] Contrastingly, Pierce and Mathews reported that their own initial chordal passages lacked 'any great tension or sense of resolution' (Mathews & Pierce 1991, p. 172).

examination of my research program via a necessary diversion into philosophical considerations. But first—notation!

1.5 BOHLEN–PIERCE NOTATION

> X in our alphabet being a needless letter has an added invincibility to the attacks of the spelling reformers, and like them, will doubtless last as long as the language.
>
> Ambrose Bierce, *The Devil's Dictionary*

1.5.1 Notation(s) or Not?

My own practice has relied very little on written notation, partly due to the improvised or semi-improvised nature of many of the compositions, partly due to their construction in some cases by methods (such as 'spectral subtraction'—see the track 'Mattavāraṇa', pp. 68-69) that do not rely on such approaches, and partly due to working extensively with MIDI 'piano roll' notation directly within digital audio workstation software.

The field of BP notation has existed from the outset in the same slightly uneasy relationship to 12–ET as in the theoretical areas. Almost all systems of BP notation that I have seen (and will discuss) seem to rest on an assumption that 'scores' will be written out and distributed as 'parts' to particular performers. This may well be so, and has been so in early practice, but BP is not conceptually tied to any particular 'art music' tradition, and there are many examples of improvised and popular or semi-popular presentations that do not appear to rely on written scores.[21] One must also bear in mind a still-cogent point made 40 years ago by Ralph Grier Cromleigh: in 'serious' music, 'notation systems that can be easily learned are generally written off as frivolous' (Cromleigh 1977, p. 30).

In any case, so-called 'world musics' show plentiful evidence of the lack of necessity of written music notation, at least outside systems based on polyphony and/or triadic harmony. Hormoz Farhat pointed out that, prior to the nineteenth century, 'Persian music was never submitted to any kind of notation. Isolated examples of notation found in medieval treatises were never an aspect of musical practice … that is why composition was never developed into an art separate from performance' (Farhat 1991, p. 8). In fact, what necessitated the adaptation of previously quite unnecessary notation was that, following increased European contact, 'students had to learn foreign music from notation so that they might be able to repeat it each time without alteration' (p. 8). This is of course the ne plus ultra of the contemporary 'Western' symphonic orchestra. But is it the apex of achievable musical culture in general?

Let us nevertheless suppose that notation will be useful to our project, if only to provide examples for examiners to follow. With that in mind, there follows a brief history of BP notation practice to

[21] For example, see Foster, S. R. 2011, *The Sky Is Thin (slightly better version)*, video recording, https://www.youtube.com/watch?v=zpy2V_tdqZQ (viewed 1 December 2018).

the present day. References to the rather fantastic history of 'Western' notation will be kept to a minimum.[22]

1.5.2 Bohlen–Pierce Notation(s)

For the purposes of the project at hand, as far as we will actually use notation at all, we will employ a system suggested by Manuel op de Coul, creator of the Scala retuning application. Op de Coul's system has become something of a default in BP music, although several others have also been suggested. This subsection will examine some of them in approximate chronological order.

1.5.3 Bohlen's Original Notation

Rights to the original considerations regarding notation naturally fall to Heinz Bohlen. His deliberations were influenced by his use of a modified electronic organ as his only experimental instrument. In his paper '13 Tone Steps in the Twelfth' (Bohlen 2001), an English translation by Bohlen of his key German paper of 1978, Bohlen gives two layouts for his keyboard, the first being his initial choice for unspecified 'technical reasons' and the second being his preferred layout when the original paper was written. Bohlen also attempted to avoid confusion by giving his drastically new notes new names that were unrelated to the ones in use for conventional music at the time:

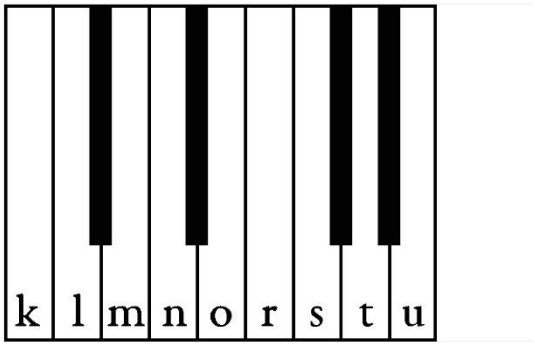
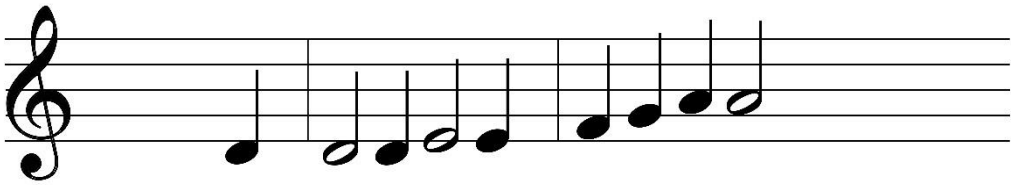


Figure 3: Bohlen's 'K-Gamma' keyboard, after Bohlen (1978, p. 623) (slightly simplified)

Here, the accidentals read (from left to right and ascending and descending divided by a slash); lis/mes, nis/os, sis/tes and tis/us. For this system, Bohlen also offered a 'transposition fitting' of a possible correspondence between a simple figure in conventional music and his new scales. For these purposes, he retained a five-line staff but adapted its expression to give the following:



[22] Again, see Cromleigh (1977, p. 33) for an overview of some of the more bizarre absurdities forced on musicians by the present system (such as the notes having different positions in each stave), and their origins in ossifications of once-reasonable thinking under changing circumstances.

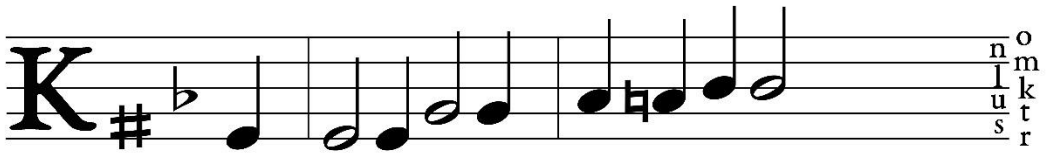


Figure 4: Bohlen's transcription of a simple 12-ET figure into BP (after Bohlen 1978, p. 623)

The large K marks the staff with the reference scale, and it is centred on that note on the stave. As we will see, the idea of retaining the five-stave bar because of its familiarity to musicians already trained in the conventional system was a preoccupation for some BP theorists from the outset. But is a retained system of this nature necessarily A Good Thing when the notes themselves have changed, not to mention their actual tonal relations, which is of course the very thing supposedly being charted?

In his *Source Book of Proposed Music Notation Reforms*, Gardner Read—composer-in-residence and professor of composition at the School of Music at Boston University—conducted a comprehensive survey of a series of historical proposals to 'improve' conventional music notation. Read described and analysed '391 of the innumerable notation systems proposed during the past three centuries' (Read 1987, p. xi), very few of which he actually approved of. He noted that 'common-practice notation [has] well served compositional styles as diverse as those of Mozart and Schoenberg, of Schubert and Bartók, of Beethoven and Ravel, of Haydn and Stravinsky' (p. 4). He devoted a chapter to proposed 'improvements' to the concept of the musical staff alone, starting with a seven-line proposal from France in 1764 (p. 11). By the time he reached Karl Christian Friedrich Krause's boast about his 13-line notion from 1811 (p.12)—that sight-reading in this system becomes ten times easier than before and that he expected all of the classics to eventually be transcribed into his system (nobody would bother with the *bad* music!)—Read remarked with a certain air of resignation that 'the systems are invariably perfect in the inventor's eye!'

This of course does not apply to the pioneers of the BP scale, who were blazing trails in *tona incognita*, but it seems appropriate to consider Read's remarks generally in the context of this subject. What are the desirable features of a notation for a new scale? What should it be doing and not doing? Should it try to preserve links with the past, or will that just heighten confusion?

1.5.4 Mathews, Pierce, Roberts et al. on Notation

These early pioneers seem to have been more concerned with establishing the precepts of the 'new' scale, as they thought of it before their acquaintance with Bohlen's (and van Prooijen's) prior work. However, in the chapter on scale in *Current Directions in Computer Music Research* (Mathews & Pierce 1991), the authors provided a notation as used by Alyson Reeves in the composition of some works on the CD accompanying the book, thus:

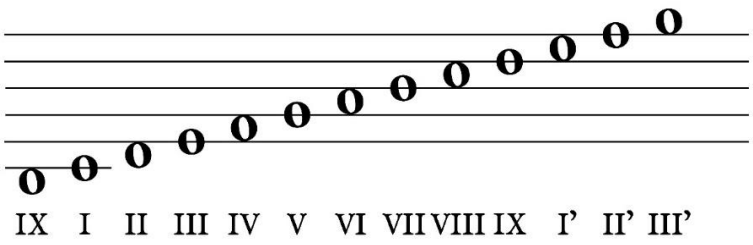


Figure 5: Alyson Reeves' BP notation (after Mathews and Pierce 1991, p. 172, simplified).

This is for the nine notes of the BP scale as employed by these researchers at this stage. There is no information given about accidentals and their treatment. Again, the five-line stave is preserved, as is the analogy to common-practice notation.

1.5.5 Op de Coul Notation

As remarked, the notational system proposed by Manuel Op de Coul has evolved into something of a default in current BP practice (although not by any means without exception). This retains the five-line stave and even the bass and treble clefs:

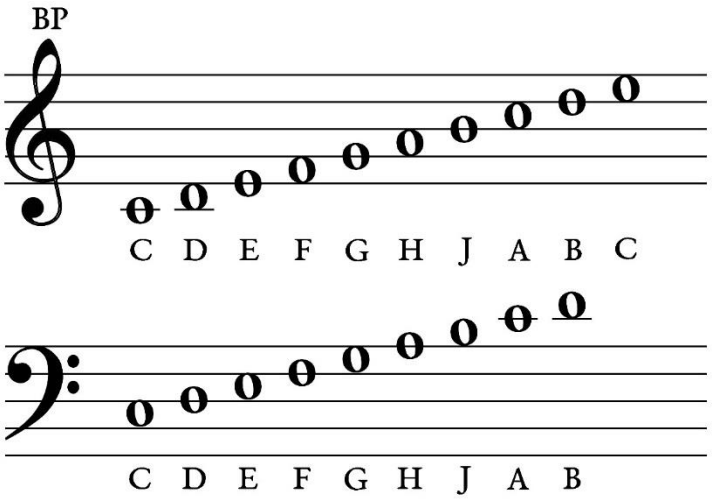


Figure 6: Op de Coul Notation, (after Hugyens–Fokker 2013, para. 5).

This system, based on Bohlen's final choice of the Lambda mode as a reference scale (Lambda having no accidentals when starting on C), seems to have been the most widespread up to this point. It retains the five-line stave and the treble and bass clefs from 12–ET notation and more familiar note names while retaining accidentals in the notation system and the concept of key notation.

This is the system in which Walker's research was conducted and in which I began my own explorations in my Honours year in 2015. For this reason in particular, insofar as I will notate anything in this exegesis, I will notate it in this system unless I inform the reader otherwise. This is done with no sense of finality but with a bow to expediency. Other proposals have been made, and a few of the most salient ones will now be discussed.

1.5.6 TranSpectra Notation

TranSpectra, the Canadian classical music collective headed by the clarinettist, physicist and BP clarinet-maker Stephen Fox, proposed another notation system. Again, it is based on a retention of the five-stave system, but with a different system of note names:

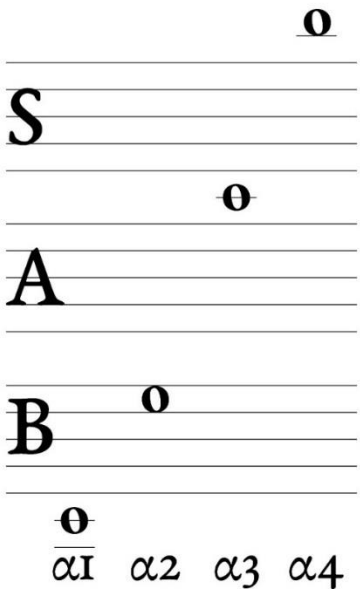


Figure 7: TranSpectra Notation (after TranSpectra n.d., para. 14, slightly simplified).

In this instance, the names on each stave stand for 'bass', 'alto' and 'soprano' respectively. The ensemble also proposed a new tuning in which the reference note is ά3 at 440 Hz.

1.5.7 Müller–Hajdu Notation

Müller, Orlandatou and Hajdu (2014) devoted a section to notation—credited to Müller in the introduction—in their chapter on BP in the book *1001 Microtones*. In this useful overview of various approaches to the subject—which describes some systems we will not cover here—Müller pointed out that 'different scenarios require different approaches to notation'—a conductor might favour a score 'written in standard Western diatonic notation with microtonal accidentals' (p. 133), whereas a performer might prefer a fingering-based system, and 'for a composer or theorist it would be useful to read scores in a chromatic BP notation'. Müller also pointed out that systems based on a five-line staff carry the risk of confusion for players; as in Op de Coul notation, 'the BP interval c–c is meant to be a tritave but is notated like the traditional c'–e" which causes a double confusion in terms of the meaning of the interval: c–c is usually considered an octave, but here it indicates a tritave (perfect twelfth), plus one would read a tenth in standard notation which has nothing to do with either' (p. 133).

With these types of problems in mind, the authors proposed a new six-lined-staff system with, again, new note names starting from the letter N and running through to Z and a new tuning system:

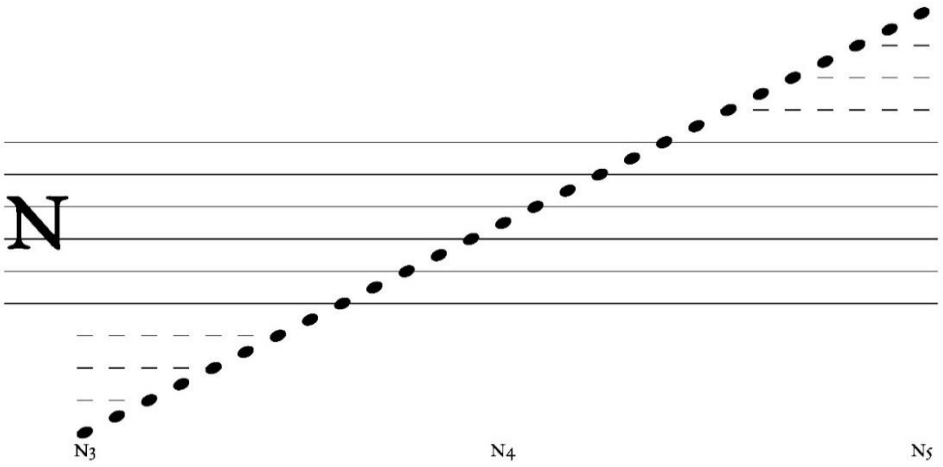


Figure 8: Müller–Hajdu Notation (after Müller et al. 2014, p. 135, simplified)

This system, which can be split between different staves as desired (the authors suggested 'T' and 'Z' clefs), has the advantage of being chromatic; as it is not based on a reference mode, there is no need to use accidentals, as every one of the 13 notes has a unique identifier. Müller felt that a six-line staff was manageable, and the division into further staves makes instrument-specific notation possible, as the N clef, for example, encompasses the standard range of the BP clarinet. These proposals certainly have their advantages, and attention to the practical demands of performance is certainly laudable. But when the practical performance proposal encompasses instrument-specific notation for performers, an additional universal BP notation for cross-communication, a further system for composition in which the T clef is used with transposed tritaves and a further still for conductors in which 'both the Müller–Hajdu notation and a standard microtonal notation' are employed 'by the use of an electronic score that allows switching between both notation systems' (p. 137), one wonders how much gain is really being made in the areas of clarity and simplicity.

1.5.8 Notation in Summary

The question of BP notation is, like almost everything else about the scale, in a state of flux, and it seems doubtful that the last word has been uttered on the subject. I again protest diffidently that my own practice has not actually required the use of notation as yet. Should it ever do so, I might well proceed with using Op de Coul notation for no 'better' reason than that my existing acoustic instruments were designed with that system in mind, and it works well enough in practice. Thus is inertia born even at the leading edge of the 'avant-garde'.

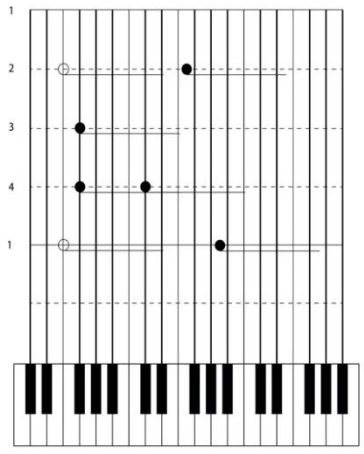


Figure 9: Klavarskribo notation. (Courtesy Dr Ian Stevenson.)

Müller cited the Klavarskribo system of notation as an inspiration for the Müller–Hajdu system. This system, an invention of Dutch electrical engineer Cornelis Pot in 1931, is described by Read (1987) as 'Esperanto for keyboard notation' (p. 76). The name itself is Esperanto and means 'keyboard writing'. Like the Müller–Hajdu notation, it is chromatic, and its five-line staff runs vertically rather than horizontally, as though a piano keyboard were being projected down a page. This system survives in limited use today, unlike most of Read's subjects, but Read pointed

out that although 'it is by far the most successful' of the systems he is concerned with (p. 76), it is 'still rooted in conventional diatonicism and chromaticism', and 'microtonal intervals cannot be easily depicted' (p. 77). Of course, these remarks do not necessarily apply to the Müller–Hajdu system, but they are useful for considering what a theoretical BP notation system would require to be effective.[23]

Read noted that these questions are not by any means new concerns. On page 5, he mentioned Erhard Karkoschka's *Notation in New Music* from 1972, which proposed eight pre-requisites for any viable new system of notation, thus:

> 1. It should possess all the possibilities of conventional notation. Only technical possibilities are intended here, not æsthetic ones.
> 2. It should not go against tradition without good reason.
> 3. It should have enough new technical possibilities to be able to represent the present stage of musical thinking.
> 4. It should be capable of presenting complicated structures in a simpler form than does present-day notation.
> 5. It should have a broad, neutral basis and avoid, if possible, representing any particular style.
> 6. It should make easier the transition to individual notation forms, e.g. approximate values and musical graphics.
> 7. It should have no difficulty in being able to represent more than twelve values in an octave.
> 8. What the ear hears must be presented to the eye in such a way that two basic characteristics are taken into consideration:
>   (a) The visual event must be apparent as the direct translation of the auditory event, requiring as few additional thought processes as possible.
>   (b) The individual symbols and the totality of symbols must be formed on an optical basis; they must be 'correct' in the visual–psychological sense. (p. 10)

These are useful guidelines, although as Read pointed out, they are not beyond question. Nevertheless, considered in a general sense, they indicate the extreme difficulty to be faced by people who attempt to evolve a single, workable common-practice BP notation system. I doubt I will live to see it if it ever comes into being, and I do not envy those who take on this herculean task.

We will now proceed from these general areas of history, background, literature review and practical considerations such as notation to a section dealing with the philosophy and methodics underlying the project.

[23] It is interesting that these regiments of reformers seem to have overlooked the rich traditions of music notation that exist outside of Western art music practice. See, for instance, the overview of East Asian notation systems in Kaufmann (1972).

Part 2: Discord (Stumbling Towards Method)

So oftentimes a discord in music maketh a comely concordance.
Spenser, *Shepheard's Calendar*

A perceptual understanding being discordant with true beliefs can nevertheless be a musical understanding.
Georg Mohr, 'On the very idea of understanding music'

2.1 PHILOSOPHY

I cannot, yet I must! How do you calculate that? At what point on the graph do 'must' and 'cannot' meet? Yet I must—but I cannot!
Earth Ro-Man Extension XJ-2, *Robot Monster*

We now enter an area of the exegesis where the methodics are to be the subject of our dissection—'methodics' being the study of method and therefore a term similar to, but rather more elegant than, 'methodology'. It therefore encompasses what I would call 'everything left over except the music and the attempts to explain the music'. This part begins with an examination of certain philosophical parameters of this study, starting with uncertainties about dogmatisms, including those of Harry Partch and tuning and intonation theorists more generally. It then develops into an examination of some more general questions in music theory. Following this, we consider 'the philosophy of doubt' in the specific form of Pyrrhonism, a form of Scepticism deriving from ancient Greece and with more connection to the subject of music theory than might be thought at first.

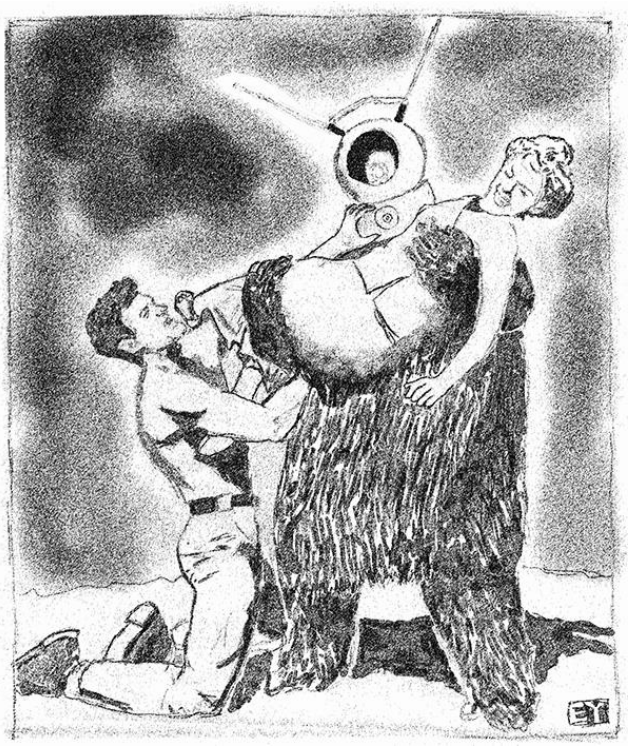


Figure 10: 'Erde Ro-Man Erweiterung XJ-2' ('Earth Ro-Man Extension XJ-2'). Lithograph by Ernst Yollam (1897-194?) from the suppressed third volume of Von Juntz's Unaßprechlung Kulten, Unaßprechliche Kulte der Zukunft, *Vergoldeter Betrug-Verlag, Stuttgart 1928. Displayed at the 'Degenerate Book Illustrations' exhibit, Mannheim, 1938.*

We then examine the theoretical grounds of my study, my previous work leading up to the

current endeavour, and the broad general creative basis for the setting of the creative works. Part 3 will examine the specific musical pieces in more detail.

2.1.1 The 'Xenotonalist'—An Outsider by Definition?

> Nothing has ever been finally found out. Because there is nothing final to find out.
> Charles Fort, *The Book of the Damned*

While there are instances of societies without written languages, such as the Incans, there appears to be no human society without a music of some description. Given this, it is a most remarkable circumstance that in the space of about a century, one particular tuning system out of a multitude of possibilities has largely conquered the world and swept everything else before it. The how and the why of this is beyond the scope of this document, which can only register the fact that 12-ET has been widely (but not exclusively) adopted in many of the world's contemporary musical cultures. This, of course, is the cultural context in which the BP scale was discovered.

The initial articulations of the BP scale were made by musical 'outsiders'. Bohlen was an electrical engineer who volunteered at a music school; although Pierce was a visiting professor of music at the time of his fateful observation to Mathews, his main professional experience was also electrical engineering. This circumstance lends at least rhetorical force to Partch's often-expressed contempt for the musical establishment of his day (more than seventy years ago), which he vituperated as enshrining 'any instrument, any scale, any asinine nomenclature, any rules—stated or implied, found in the safety deposit boxes of various eighteenth-century Germanic gentlemen whom we and our immediate antecedents have been dragooned into idolizing' (Partch 1948, para. 3). Regarding the training the conservatoria provided, he added, 'perhaps no element of modern life is so stifling—so destroys a human being—as this idol of digital and laryngeal proficiency. I know; I experienced it, and had to die and find still another womb to be born from' (para. 8).

One can argue that Partch retarded his own progress through this assiduously cultivated 'outsider' stance. In the Tonalsoft website maintained by the xenotonal theorist Joe Monzo, Brian McLaren—whose overview of twentieth-century microtonality has already been mentioned in passing (see footnote 11)—maintains a page provocatively entitled 'Partch's Errors'. Here, McLaren maintains that 'without exception, his statements on psychoacoustics embody the exact *opposite* of the truth. In short, if Partch said it about the human ear, you can count on the reverse being factually correct' (McLaren, n.d., para. 3, emphasis in original). McLaren offers an index of these errors, mostly stemming in his view from Partch's 'blithely [ignoring] all of the advances in musical psychoacoustics from 1928 through 1974'[24] (para. 9). If this is so, perhaps if Partch had stayed within the conservatory system he would have eventually found out these things for himself, to the improvement of his theory if not necessarily his practice.

The former curator of the preserved Partch instruments, musician and author Cristiano Forster, had 'worse' to say about Partch. Criticising the construction of Partch's zither-like 'Canons', and from a

[24] Two such instances cited by McLaren actually relate to Pierce's psychoacoustic research into the role of partials in conventional and 'stretched' scales and 'harmonic' versus 'inharmonic' partials (paras. 33 and 51).

position of considerable claimed acquaintance, Forster asserted that the inaccuracies of tuning imposed by Partch's construction (which he claimed to have improved on in his own designs) mean that 'his particular stringed instruments with movable bridges may not deserve to be called canons … Partch's damage to the word "canon" is irreversible and therefore permanent' (Forster 2015, paras. 24 and 29). Further, Forster accused Partch of appropriating his crucial concept of the tonality diamond from the work of the German/American psychologist Max Friedrich Meyer (1873–1967). Although Forster allowed that Partch acknowledged Meyer in *Genesis of a Music*, he also claimed that in the illustrations, 'Partch rotated Meyer's tonality diamond 90 degrees … to give the appearance of something new' (para. 65).

These are grave charges—Forster freely used the ugly words 'hoax' and 'theft'—and I cite them here merely in a spirit of critical appraisal appropriate to a doctoral project, rather than in any attempt to prove that Partch had feet of theoretical clay.[25] Perhaps he did, but if so, no more than some others; one is reminded of Feyerabend's exposition in *Against Method* of Galileo's advocacy of the telescope, in which, Feyerabend claimed, 'Galileo uses *propaganda*. He uses *psychological tricks* in addition to whatever intellectual reasons he has to offer' (Feyerabend 1975, p. 81, emphasis in original). Feyerabend went as far as to declare that (if one is to accept one conventional account of the matter) 'Galileo made progress by disregarding important facts … and by pushing a false hypothesis … to the limit' (p. 116).

Just how much regard is a creative artist obliged to pay to the underlying theory of their practice? Feyerabend did not claim that Galileo made no scientific progress—just that he did so using techniques that lie outside hagiography. None of Partch's critics have claimed that his *music* lacks value because of his theoretical 'deficiencies'.

In fact, as I was drafting this section, a recent paper came to my attention that seems to be causing a stir in the still-puncticular xenotonal pond. In *Music Perception: An Interdisciplinary Journal* (2018), Richard Parncutt and Graham Hair threw down a gauntlet in 'A psychocultural theory of musical interval: bye bye Pythagoras'. The authors claimed that the mystical tradition of music theory inherited from Pythagoras, which holds that small-integer ratios are literally a gift of the gods and a universal organising principle, has dominated 'Western' musical thinking to its detriment. Parncutt and Hair instead advanced the claims of Aristoxenus, whose surviving three books deal with music theory and contradict the Pythagorean precepts. In Aristoxenus' words, 'some of [our predecessors] introduced extraneous reasoning, and rejecting the senses as inaccurate fabricated rational principles, asserting that height and depth of pitch consist in certain numerical ratios and relative rates of vibration—a theory utterly extraneous to the subject and quite at variance with the phenomena' (Aristoxenus 1902, pp. 188–189).

Partly from these principles, Parncutt and Hair extrapolated that 'there is no internally consistent "Just" scale … and no known brain mechanism is sensitive to ratios in musical contexts' (Parncutt & Hair 2018, p. 475). Not content with this onsetting, they continued: 'musical intervals and scales,

[25] Notwithstanding, see Ensemble MusicFabrik (2013) for footage of Dean Drummond (1949–2013), former conservator of the Harry Partch Instrumentarium and member of Partch's ensemble. Associate Professor Drummond, discussing the Partch instrument 'The Cloud–Chamber Bowls', mentioned his eventual conclusion, after years of perplexity, that in painting the pitches on the delicate glass bowls that comprise the sounding bodies of this instrument, Partch 'wrote down the pitches he wanted to hear, but not necessarily the pitches that there were' (4:17).

although they depend in part on acoustic factors, are primarily psychocultural entities—not mathematical or physical … there is no perfect tuning for any interval … twelve-tone equal temperament is not intrinsically better or worse than Just or Pythagorean' (p. 475). Having thus secured the undivided attention of every xenotonalist—the vast majority of whom spend their days calculating and painstakingly comparing just these ratios—the authors casually, provocatively, concluded that 'ratio theory is an important chapter in the history [of] Western musical thought, but it is inconsistent with a modern evidence-based understanding of musical structure, perception and cognition' (p. 475). And this is just the abstract!

Partch would have raged; *Genesis of a Music* cannot be even casually leafed through (if one can read it that way) for long without encountering one of Partch's rather dogmatic dicta that 'small-number proportions = comparative consonance' (Partch [1974] 1979, p. 146). But *do they*? Parncutt and Hair said otherwise, which left them in a slight quandary; like McLaren and Forster, their business was not to claim that Partch's 'errors' led to erroneous *music*. In fact, when they admitted that 'if the music of ratio theorising microtonalists was successful in the past as it often was', they cited a paper on the work of Partch and two other xenotonalists before continuing, 'other factors must explain that success' (Parncutt & Hair 2018, p. 492). Sadly, Parncutt and Hair did not mention what those other factors were.

In any case, they did not deny their implicit point that Partch's music was successful, despite their view that his basic postulates were completely mistaken. Their evidence is persuasive, and much of it is consistent with my own findings, as I will describe later. And yet Partch could not have been led to his 'successful' conclusion without these 'mistaken' assumptions. This would not have surprised Feyerabend, but it still seems to surprise music theorists. How can theoretical 'errors' lead to æsthetic truths? Can one attempt to justify this as 'lying in the Truth'?[26]

2.1.2 On 'Zetetic Feyerabendism'

> I have never heard of any standard, in any religion, philosophy, science, or complication of household affairs that could not be made to fit any requirement. We fit standards to judgements, or break any law it pleases us to break, and fit to the fracture some other alleged law that we say is higher or nobler. We have conclusions, which are the products of senility or incompetence or credulity, and then argue from them to premises. We forget this process, and then argue from the premises, thinking we began there.
>
> Charles Fort, *Lo!*

> Se moquer de la philosophie, c'est vraiment philosopher.
>
> Pascal, *Pensees*

I have amassed much data that have a further bearing on these questions. Summarised, some of the more interesting of these include a claim to a 'natural' configuration of the human ear to allegedly innately sense a 12–ET semitone (contradicting xenotonality), a report of a remote Amazonian tribe

[26] 'And the Angel of Eris bade of the Lord: *Go ye hence and dig the Truth, that ye may come to know it and, knowing it, spread it and, spreading it, wallow in it and, wallowing in it, lie in it and, lying in the Truth, become a Poet of the Word and a Sayer of Sayings—an Inspiration to all men and a Scribe to the Gods*' (Jackson et al. 1994, p. 41, emphasis in original).

not previously exposed to 'Western' music who supposedly fail to classify 'Western' major and minor triads as 'happy' or 'sad', and a report that a species of monkey considered unaffected by music showed strong affective responses to pieces that were especially composed for their hearing range and on the basis of their communication calls (contradicting the theories of the 'uniqueness' of the music sense to humanity and perhaps the 'unconsciousness' of animals) (Bell & Jedrzejczak 2017, McDermott et al. 2016 and Snowdon & Teie 2009 respectively). I also adduced some observations of an Aboriginal music from the Kimberley region of Western Australia (Will & Ellis 1996) that is apparently organised on the basis of related frequencies rather than small-integer ratios or any sort of ratio beyond frequency relationships (contradicting ratio-based theories). Of course, several of these observations also contradict each other.

It might be thought that this 'sceptical' and 'contradictory' material amounts to the adoption of a particular philosophical stance on my part, namely that I am claiming that we know nothing and can know nothing and that therefore psychoacoustical research and music theory are innately futile. This is something of an over-simplification of my actual 'position'—as well as being fairly obviously at variance with observable realities of music and its philosophy and history—but since the interpretation has arisen, I suppose I am obliged to address it.

The ultimate origin of the 'school' of philosophy known as Pyrrhonism is the work of the ancient Greek philosopher Pyrrho of Elis (365–360 BCE to 275–270 BCE). His form of 'classical Pyrrhonism' holds that it is impossible for us to determine whether or not our perceptions and opinions are either an accurate *or inaccurate* reflection of 'external reality', and that the most desirable object of existence is to reach a non-judgemental state of *ataraxia* or equanimity through the practice of *epoché* or the suspension of judgement. Much of what is known of Pyrrho's own original teachings (it is said he left no writings) comes from the later work of his follower Sextus Empiricus (c. 160 CE to c. 210 CE), whose *Pyrrhōneioi hypotypōseis* or *Outlines of Pyrrhonism* stressed the value in this context of recognising the 'equal strength' (*isostheneia*) of all competing arguments over a particular issue.[27] I trust that the attentive reader will have observed an element of this practice in my coverage of the questions of tonality thus far.[28]

However, this is not by any means to be taken as a denial of the possibility of knowledge in itself. In fact, that stance is more generally associated with 'academic scepticism', which originally derived

[27] Sextus Empiricus also wrote two volumes, which are both preserved under the single title of *Against the Mathematicians*. A book in one of these is entitled 'Against the Musicians' (*Adversus Musicos*—Empiricus 1986), but Sextus distinguished 'between musical theory (ἐπιστήμη τις περὶ μελῳδίας καὶ φθόγγους καὶ ῥυθμοποιίας) and musical skills (ἡ περὶ ὀργανικὴν ἐμπειρία), and resolves to attack only the former' (Corti 2015, p. 136). Sextus went on to argue 'against the existence of music as a suitable subject for theoretical discourse, with Sextus leaving unstated the arguments in favour' (Morison 2019). One of Sextus' arguments was that a musical sound cannot really exist because in order to be sounded, it has to evolve in time. However, just as a pile of bricks is not yet a 'house' and rows of timber laid out on a beach are not yet a 'ship', it is impossible to think of a tone being sounded as a 'note'. And, in any case, 'time' does not exist in the sense usually conceived, as it combines the present with the imaginary quantities of 'past' and 'future'. See Riethmüller (1975) for a summary of this and the other main arguments, and Empiricus (1986, pp. 172–173) for the original analogies of the ship and the house.

[28] Not to mention the similarity of some of these ideas to those of Feyerabend: 'one of the very few great contemporary philosophers who clearly adopts a line of thinking similar to that of the Ancient Sceptics, and tries to develop this theory from its epistemological and philosophy of mind origins to its practical consequences in political and moral philosophy' (Athanassopoulos 1994, p. 17).

from the position of the Platonic Academy of Athens during the tenure of Arcesilaus (c. 316 BCE to c. 240 BCE) as scholarch or 'head' of the school. This position was always distinct from that of Pyrrhonism, which stressed (and as 'neo-Pyrrhonism' continues to stress[29]) the inadvisability and 'impossibility' of making dogmatic *affirmations or denials* about beliefs derived from knowledge—particularly since the same phenomenon can appear very differently to different perceivers.

All of this, of course, is to rapidly skate over a whole school of thought in a few paragraphs, but such a simplified summary is necessary for our purposes. This is found rather neatly in an entry on the subject from the *Routledge Encyclopedia of Philosophy*: 'when Pyrrhonians describe their affective states, they do so undogmatically—and the Sceptical slogans ("I determine nothing", "nothing is apprehended", and so on) are to be understood in a similar way, as merely reporting a state of mind and not expressing a commitment. Thus the slogans apply to themselves, and like cathartic drugs are themselves purged along with the noxious humour of dogmatism' (Hankinson 2019).

It has been further objected that cognitive science and music perception and cognition studies are not characterised by dogmatism. In Juan G. Roederer's 'Music and the evolution of human brain function' in the book *Music That Works*, along with the expectation that a final 'answer' to the evolutionary 'purpose' of music 'may be around the corner' (Roederer 2009, p. 195), Emeritus Professor Roederer (a highly respected researcher) footnoted his view that 'bird song seems beautiful music to *humans*, but for the birds it is just their way of communicating very concrete messages concerning reproduction, feeding and danger' (Roederer 2009, p. 206, n. 1, emphasis in original). One might think that, even to a person holding such a firm view, the question of *how and why* humans interpret—or apparently *mis*interpret—bird song as 'beautiful music' would be highly cogent, but Roederer does not seem to address this issue. In any case, as Dr Hollis Taylor pointed out, 'many of the objections to birdsong being considered music are a flawed assessment of both human music and birdsong. For instance, these days most musicologists believe that human music is also functional. Indeed, so vast is human music's scope and so numerous and even conflicting are its functions, that no single explanatory model holds sway'[30] (Australian Broadcasting Corporation 2018).

To this I can only add a couple of further necessary remarks by way of clarifying my 'position'. One is about the 'Zetiticism' I have enlisted to my 'cause' here. In Dr Tiziano Dorandi's new translation of Diogenes Laërtius (Dorandi 2015), the third-century CE biographer of philosophers, Laërtius classified Pyrrhonians as 'Aporetics, Skeptics, Ephetics, and Zetetics, these labels being derived from their doctrine if we may call it that' (p. 21). A Zetetic Pyrrhonian is one whose activities are characterised as '*zetetic*, because they constantly searched for the truth' (p. 22, emphasis in original). Few people in a state of sanity propose devoting extensive amounts of time to the pursuit of a goal

[29] '**Pyrrhonism**, *n.* An ancient philosophy, named for its inventor. It consisted of an absolute disbelief in everything but Pyrrhonism. Its modern professors have added that' (Bierce (1967) 1983, p. 258).

[30] We can only note in passing the ideas of Chris Knight and Jerome Lewis on the possibly related origins of a number of significant human traits (Knight & Lewis 2017), including music and language. The former is ascribed to early humans vocalising in groups at night to intimidate possible predators. They report more than one contemporary case of 'forest dwellers [using] rhythmic clapping, drumming, chanting and choral singing explicitly to keep wild animals away' (p. 436). This seems as good an 'explanation'—or partial explanation—as any.

that they do not believe is ultimately achievable in *some* fashion—even if the pursuit and the goal are effectively the same thing …[31]

I am not a scientist and still less a cognitive scientist, but as we have seen, the areas we have been exploring have necessarily touched on these questions to an extent. For this reason, I conclude with a placement of my own current 'position' on broader questions of 'mind' in an already-existing and at least quasi-reputable camp—that of the 'mysterians' or 'new mysterians'. This is a somewhat catch-all term used to designate a related group of thinkers who share the view that the 'hard problem' of consciousness itself is probably ultimately intractable. In a recent Dewey Lecture, Noam Chomsky—often included in this camp along with Colin McGinn, Thomas Nagel and others—suggested that 'the common slogan that study of mind is *neuroscience* at an abstract level might turn out to be just as misleading as comparable statements about chemistry ninety years ago—if, that is, we have in mind today's neuroscience' (Chomsky 2013, p. 670, emphasis in original). He continued: 'There is reason to believe that what reaches consciousness, even potentially, may well be just a scattered reflection of inaccessible mental processes, which interact intimately with the fragments that do sometimes reach consciousness' (Chomsky 2013, p. 671). Chomsky then cited, in this context, the famous experiments of Benjamin Libet (1916–2007) in the 1970s and 1980s, which at least appeared to show that unconscious neural activity significantly precedes what is experienced by experimental subjects as conscious volition. Chomsky also mentioned the evolutionary biologist and geneticist Richard Lewontin (1929–), who pointed out that 'we know essentially nothing about the evolution of our cognitive capabilities, and there is a strong possibility that we will never know much about it' (Lewontin 1998, p. 109). In a letter to the editors of the book in which his article appeared as a chapter, appended in response to their lamenting his '"unremitting attack" on the study of the evolution of cognition', Lewontin concluded, 'finally, I must say that the best lesson our readers can learn is to give up the childish notion that everything that is interesting about nature can be understood …. Form and even behaviour may leave fossil remains, but forces like natural selection do not. It might be interesting to know how cognition (whatever that is) arose and spread and changed, but we cannot know. Tough luck' (Lewontin 1998, pp. 129–130).[32]

As scholars, we must accumulate data and (seeming) patterns and educated guesses and attempt to pass them on in some sort of comprehensible form. Certainly, the focus of our ignorance has refined somewhat since Empiricus perhaps fancied he had lit a fatal fire beneath music theory—did he really believe that it could even be done?[33]—but as the Australian neurophysiologist Sir John Eccles (1903–1997) put it in his Nobel acceptance speech in 1963, 'the more we know, the more the mystery grows' (Eccles 2019). And so it does, quite possibly forever.

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[31] 'The system of [Empiricus'] School, however, was, to have no system. Their only dogma would be, doubt of their own scepticism. Their attitude involved a shocking dread of ontology' (Lindsay 1922, p. 59).

[32] But, in turn against this—isosthenetically or equipollently—we have the guesswork of Knight and Lewis.

[33] 'What distinguishes the incisive and exact methodics of the Sceptics is precisely that they refuse to be satisfied with theoretical assumptions … The philosophico–scientific rigour and the methodical acuity with which Sextus Empiricus pursues his sceptical vocation of showing in *Adversus Musicos* that the venerable edifice of music theory is just a castle in the air is unique' (Riethmüller 1975, pp. 193–195, my translation).

2.2 OBJECTIVES OF THE STUDY

2.2.1 Research Question

And so we find ourselves before the question governing everything that is to come; we are trying to acquire new and useful knowledge about a scale or system in which comparatively few musical works have yet been created. Within this system—about which theoretical knowledge is still nearly non-existent, and what there is of it is mostly based on conjecture and extrapolations from 12–ET, which may not apply in any case—various works have been created that raise questions of audience resistance to the new music, which is perceived as 'odd' and/or 'unpleasant', at least by some listeners. The starting point of this project is the provisional acceptance that this resistance is a 'problem', at least in the twofold sense that: a) it is possible to overcome audience resistance to BP music, and: b) this is desirable to do and worth doing. The research question thereupon largely frames itself:

> **Are there ways in which creative explorations of the Bohlen–Pierce scale can offer an effective context and/or impetus for the creation of new musical works?**

This, then, is the context in which these investigations have been made. They are not presented as exhaustive. Little enough is known about the grounds for departure, let alone the ultimate destination …

We have already seen that the sacred cows of 'conventional music theory' can be legitimately questioned on the grounds laid out by Sextus Empiricus, Feyerabend and others. Further, there are similar grounds—furnished by Parncutt and Hair, among others—for questioning the ratio-based theories of Pythagoras and Partch. However, one of the common features that these two otherwise somewhat divergent theories share is a strong belief in the primacy and significance of the octave. This interval, together with the fifth (which will be discussed further later) is held to be 'pure' as both Helmholtz and Percy Scholes expressed it. The nature of this 'purity' is never quite defined, but Helmholtz suggested that in the case of the fifth, it was due to its nature as 'a perfect consonance, in which there is no sensible disturbance of closely adjacent upper partial tones' (Helmholtz [1885] 1954, p. 188). This explanation is repeated in many sources in regard to the nature of the octave. And yet, even on such a fundamental point as this, there are grounds for still further Zeteticism. A paper by Assistant Professor Frédéric Voisin in the *Leonardo Music Journal* in 1994 offers some insights into the perception and practical treatment of the octave interval in two musical cultures: the Central African Republic and Java.

Rather than attempting to shape the study according to 'Western' perceptions, Voisin presented the musicians with modified synthesisers that were readily retunable and asked them to put the synthesisers into the tunings *they* preferred to use. Voisin reported that the African musicians were able to discriminate intervals of +/– 10 cents in practice (Voisin 1994, p. 89), which makes another observation still more suggestive; the pentatonic scales used by the Africans were perceived by them to be a succession of five equidistant intervals rather than a five-fold division of a conceptualised octave (p. 89). And while the octave is 'recognised as a fixed and standard reference' for theoretical purposes, in practice 'these musicians do not judge a strict octave (1200 cents) to be better than a large major seventh (1150 cents) or a small minor ninth (1250 cents)' (p. 89). Even more remarkably, 'the Banda Linda musicians prefer the small "octave" (1150 cents) in any register, probably because of the

roughness it creates on the octaves that are always played simultaneously with double sticks in each hand' on their xylophones (p. 89).

Yet we have Helmholtz's foundational *suggestion* that octave 'consonance' *supposedly* derives from the absence of this quality of 'roughness'. Regarding this, Voisin suggested that 'these paradoxical observations could be easily explained once the Western concept of consonance was left behind' (p. 89). Voisin concluded that 'the study of scalar systems cannot be based solely on acoustical measurement, as tuning research has been until now, but must also consider the conceptual dimensions of scale in the various cultures studied' (p. 90). Perhaps it is possible, and even advisable, to follow these different means of apprehension into the practical and creative study of the application of entirely new scalar systems.

2.2.2 Inside and Outside Traditions

> The wanderer uses the map to find his way but he also corrects it as he proceeds, removing old idealizations and introducing new ones. Using the map no matter what will soon get him into trouble. But it is better to have maps than to proceed without them.
>
> Feyerabend, *Science in a Free Society*

All of this is not by any means to be interpreted as a destructively critical evaluation of previous or current BP practice. Using Feyerabend's analogy of the map, practically the only spots known to exist on the map at the outset were the hometown of 12–ET and some suburbs generally called 'The Microtonal Zone'. It was perhaps inevitable that first explorations could not and would not stray far from home. And home was a place largely based on conceptions of triadic harmony; at any rate, that is what the early pieces tended to be based on.

My own early research, which led to this doctorate, did not seek to challenge those conceptions too greatly. In fact, at the time that I started my Honours research into BP, I stayed within the 45 'known' modes of BP that were expressed by analogy to Western art music theory. Because of this, a brief account of these concepts and my eventual divergence from them during the early doctoral period is presented below.

2.3 BOUNDARIES OF THE STUDY

2.3.1 A Year of Honourable Guesswork

Much of the early research into BP is preserved in *The Bohlen–Pierce Site*, a compendium of data originally maintained by Heinz Bohlen and now archived by the xenotonalist Huygens–Fokker Foundation in Amsterdam (http://www.huygens–fokker.org/bpsite/). It would be difficult to overstate the contribution of this source to my research, particularly in its early stages as described here. The site is divided into a number of different areas, and among these is a page on 'BP modes and tunings'. This speaks of the historical development of BP modes from Bohlen's first research.

The page expresses these initially in graphic form, placing all of the notes of the chromatic BP scale in a circle, thus:

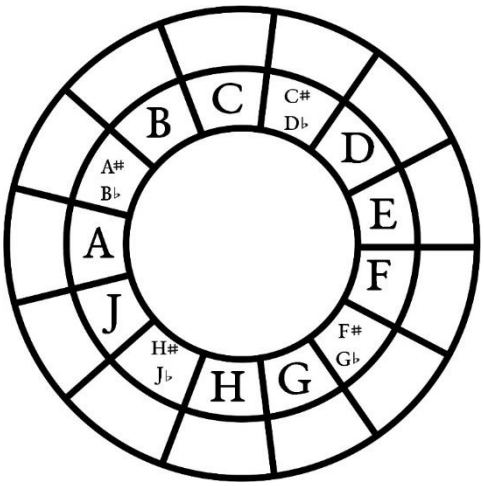

Figure 11: BP modal circle, after Hugyens–Fokker (2009).

Expressed in this fashion, the site proceeds to expound the methods by which families of modes were articulated—the first family being the 'Lambda' modes. These are defined by the common property that there are no two successive steps in any mode that are both whole BP tones. Mapped onto this diagram, with the Lambda mode commencing at the 'tonic' of the C, nine modes emerge that satisfy this condition, thus:

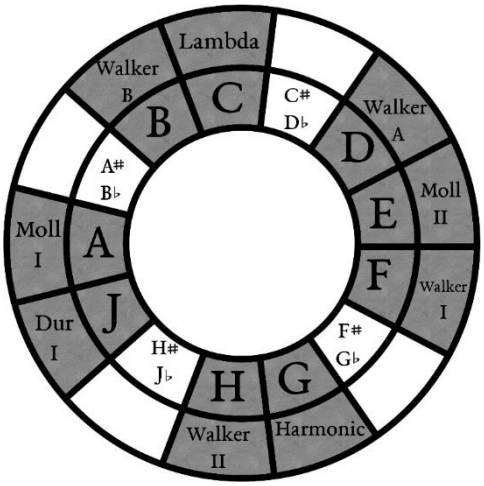

Figure 12: Lambda family of modes, after Huygens–Fokker (2009, para. 2), slightly simplified.

In this figure, each mode can be derived from each starting note (ignoring accidentals, which are not shown here) by 'rotating' the outer circle to the right. The Lambda mode, which contains no accidentals on C, was nominated as the reference mode by Bohlen—a usage that has largely stuck. The five modes not named after Walker are nine-note modes that can be regarded as two assemblies of five-note arrays—'pentachords' overlapping at a central, shared BP semitone. These all have a span of a total of six semitones in each pentachord. The 'Walker' modes have pentachords separated by a BP tone, and the span of each mode varies.

These are all of the modes that can be made available under this set of constraints. If, however, the constraint of the avoidance of successive semitone intervals is lifted, four other families of modes become possible. The Hugyens–Fokker website names and illustrates only the first of these families—the Gamma family:

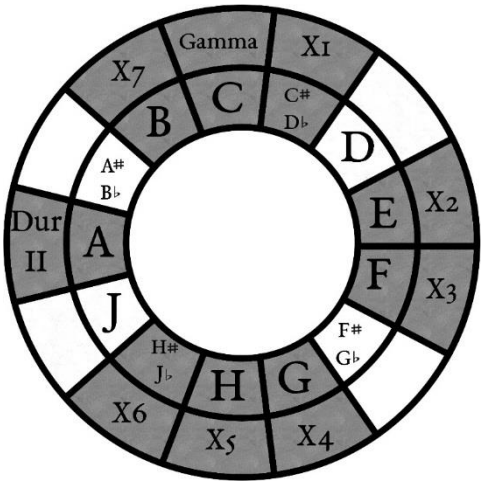

Figure 13: The Gamma family of BP modes, after Huygens–Fokker (2009, para. 6).

In regard to all of these modes—and the ones given the 'X' prefix were, to the best of my knowledge, entirely unexplored at this time—the website states that their exploration is 'only of academical interest' as 'it goes without saying that 2 or 3 good ones would be all that it needed, and it is highly likely that the Lambda family can provide those' (para. 7).

This statement gave me so much food for thought that it became the basis of my Honours project. How was it possible that some 35 modes of this 'pentachordal' species, which had apparently never been sounded or heard by any human or other ears, could be dismissed so readily as useless for creativity? There might be sound theoretical reasons for that decision, but they were not explicitly stated, and I could not find any reason in existing literature to justify their exclusion. The Honours project thereby formulated itself: I would create recorded music in all 45 of the known BP modes, just to hear what they sounded like. Anyone interested could draw whatever conclusions pleased them.

The first theoretical task was to map out all 45 modes. Knowing there were five families of modes, for convenience in referencing I renamed these on Discordian principles; the Lambda family became the 'Chaos' family, the Gamma family became 'Discord' and the other three unnamed and unillustrated families became the 'Confusion', 'Bureaucracy' and 'Aftermath' families. Modes within these were numbered from one to nine; the 'Lambda' mode became 'Chaos 1', the 'Walker A' mode became 'Chaos 2' and so forth. Mapping the remaining three families of modes onto a ringed graphic achieves the following result:

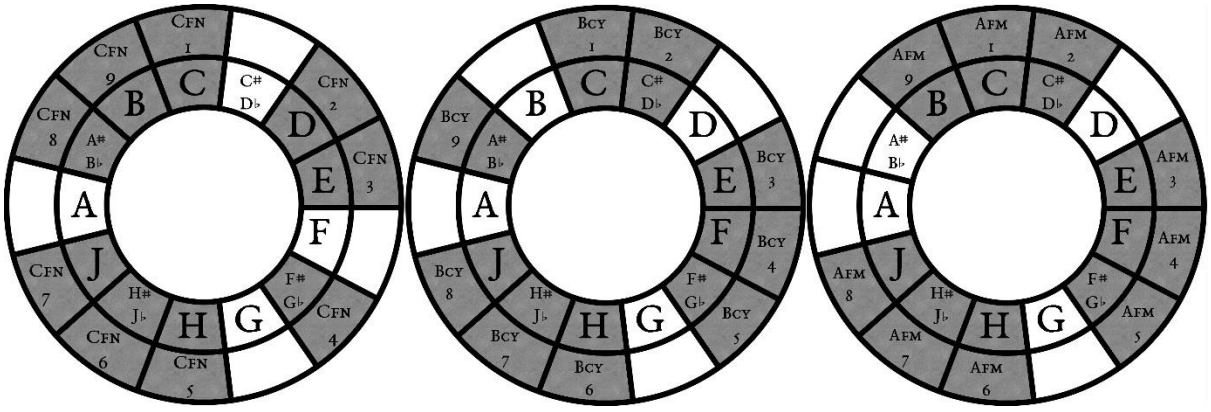

Figure 14: The three 'theoretical' families of modes.

As far as I can see, this concludes the available families of modes under this approach. I will not offer comprehensive charts of all modes in all keys; these are available as an appendix to my Honours thesis (Holmes 2015, Appendix A) and are not really relevant to the present study in any case.

2.3.2 Nairjhara: 45 Improvisations in the Bohlen–Pierce Scale.

I was now in a position to commence work on a series of short improvisations in each of the 45 modes. These were all to be done in a similar idiom and presented as work that was recovered from the ancient (and entirely imaginary) pre-human culture of the Laramidian people, who were great aficionados of the BP scale, upon which their music was almost entirely based until their eventual downfall (see Part 3 for further details). This required the construction of acoustic musical instruments, so a plosive aerophone, the Paddlemelan, was designed and constructed from scratch (see p. 43). A guitar, the Protong, was created from a kit guitar with a refretted neck (see p. 44), and an extremely cheap electric violin was obtained. With these instruments and a Max/MSP application that I created to 'play' a field recording of a local waterfall by filtering it into the appropriate frequencies, a short improvisation in each of the 45 modes was created as a final work. To avoid any personal prejudice (and to avoid the necessity of creating 585 improvisations for complete coverage—in the sense of one improvisation in each of the 13 possible 'tonics' of the 45 modes), one of the 13 available 'tonics' was selected randomly for each mode. The result was—although a greatly reduced cross-section—the first sounding ever of the vast majority of this material, at least since the time of the dinosaurs, when the Laramidians made their music but then disappeared without leaving a single physical trace of their existence—at least until very recently. But that is another story for another section.

2.3.3 Lessons Learned

Most of those who offered feedback said that they found the material 'hypnotic' or 'soothing'. One reviewer spoke of a sensation of 'pleasant melancholy'. These results were consistent with my own subjective impressions, although I would have preferred to have had much more time to rehearse thoroughly. As a deliberate æsthetic decision—probably influenced strongly by the Persian classical music that I was listening to extensively—I opted to use the first take of every instrument's improvisation (except for a handful of cases of absolutely catastrophic disaster), and to pay no particular heed to 'Western' concepts of triadic harmony.

My general impression was that, at least in this idiom, there was no reason to conclude that any of these modes—'theoretical' or otherwise—was any better or worse than any other as a source of musical creativity. There may perhaps have been some distinctions in formally structured pieces in the Western art music tradition, but in these terms of heterophonic improvisation, nothing stood out as unusable. (I had no explicit knowledge at the time of the actual methods of creation of Persian classical music, and particularly the interplay between what we call 'improvisation' and the starting point in the 'radif' or determining melodic fragment (see Nooshin 2003), which can change greatly in the course of a piece, but I daresay that these techniques exercised a significant if unconscious influence on the overall process.) The instruments that I created and adapted were all equally tempered for reasons of convenience. A fretted instrument expressing a just-tempered scale is generally obliged to have different frets for each string; this can be done, but at a considerable sacrifice of time. My calculations suggested that the average distance between the fret positions for each respective tuning was 1.4 mm, with a maximum difference of 4.5 mm at one fret (Holmes 2015, Table 2). I wonder whether anyone's fingers are capable of consistently achieving that first degree of intonational precision in practice, and as for the capacity to hear a meaningful difference as a consequence, I can only shrug expressively. Again, we can provisionally chalk one up to the credit of the ratio sceptics, but as will be seen shortly, I have made both forms of music available in this current project for a direct comparison and evaluation to be made available to the listener.

2.3.4 The Vathek Modes

This, then, was the situation at the outset of the doctoral journey. I had an open brief for exploration of BP tonality in any way I pleased. However, I was increasingly unhappy with following paths set out by Western art music theory. Could one be certain that they formed the best—or even the only—way to proceed? Was it possible that, as Feyerabend suggested, this framework might even be deleterious or disruptive to the 'proper' (read 'effective') use of the new material by imposing what he called 'premature precision' (Feyerabend 1975, p. 215)? I had already avoided triadic harmony altogether in an Honours project that was judged to be successful, but this approach was predicated on a series of improvisations of not more than one minute in length. I wondered what *sorts* of 'harmony', if any, it might be possible to employ in longer-form pieces; with this in mind, I began a provisional campaign of reading that was guided by personal æsthetic preference to the 'musics of the Mediterranean basin' as a starting point.

It was not long before I came, via Byzantine and 'Arab–Andalusian' musics, to the work of Peter Manuel, and specifically his 1989 paper 'Modal harmony in Andalusian, Eastern European, and Turkish syncretic musics'. Here, Professor Manuel expounded on what he regarded as a common organisational principle uniting these styles, namely 'a harmonic–melodic system qualitatively distinct from that of Western common practice' (Manuel 1989, p. 70). The musics under study '[employ] scales deriving from a purely modal tradition, as opposed to the Western major and minor scales', and 'the chordal vocabularies … are not rooted in Western common practice tonality, but rather in the potentialities and idiosyncrasies of the mode in use' (p. 71). Manuel located this practice—and the modal organisation generally—in a 'Phrygian tonality' that 'is most probably a syncretic product of the modal traditions of pre-Moorish Spain, Arab modal musics, and Western common-practice tonality' (p. 72). This, in turn, at least in the Andalusian context, 'reflects certain affinities with' the *Bayati* and *Hijaz māqāmat*—microtonal scales/modes in use in Arabic urban

musics today, in which the fourth degree 'functions as a secondary tonic and as a relatively stable resting pitch' (p. 72).

From this, a system of chordal accompaniment very different from that of Western practice is derived—so much so that Manuel suggested that a different form of progression analysis would apply—but obviously only to this system it stands within 12-ET. What is more directly relevant to us is that the *Hijaz māqām* employs a raised or 'neutral' third degree—Manuel gives the pattern E F G# A B C (raised a quarter tone) D E D C natural B A G# F E—and a 'characteristic augmented second between the second and third scalar degrees', which, together with the harmonic treatment referred to by Manuel, 'might even enable one to speak of a "Mediterranean tonality"' (p. 75). Regardless of whether Manuel's system reliably describes a 'Mediterranean tonality', reading the paper gave me pause for thought—so much so that I was given to wonder what might be potentially achieved by introducing a single 'augmented' scale degree into a BP mode in a way that did not necessarily respect the 'pentachordal' construction of the previous modes.

The result, about halfway through the first year of study, was the first expression of what I called the 'Vathek mode' or family of modes.[34] Given the chromatic BP scale, with a 'tonic' of C;

Step	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Note	C	C#/Db	D	E	F	F#/Gb	G	H	H#/Jb	J	A	A#/Bb	B	C

Table 4: Chromatic BP scale.

With the same 'tonic', if one must speak in such terms, the first 'Vathek' mode I expressed would look like this:

Step	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Number	I	II			III	IV		V	VI		VII	VIII	IX	I'
Note	C	C#/Db			F	F#		H	H#/Jb		A	A#/Bb	B	C

Table 5: A Vathek mode.

[34] The name is of course a reference to the eponymous hero of the Gothic novel published by the 'eccentric' William Beckford (1760–1844) in 1786. This work is a pseudo–Oriental fantasy strongly influenced by *The Thousand and One Nights*. It is interesting to note in this context that there is some evidence to suggest that the original prototype of the latter work actually comes from eighth-century Persia in the form of a work called *Hezār Afsān* or 'The Thousand Stories'. To that extent, the choice of the 'Vathek' name for the mode may also be taken as having an indirect (and even unintentional) reference to the sort of distorted reflections of Persia/Iran in the 'West' as examined by Rahmani (2007). The usage throughout this exegesis of the term 'eccentric' corresponds entirely to the standard dictionary definition of 'odd' or 'whimsical'. It is kept in quotation marks throughout the text because, as Frater Perdurabo puts it, 'In the case of Sir Isaac Newton … the reader will recall the fact that he would seek mental relaxation by endeavouring to balance peacock's feathers upon his nose and that people who discovered him engaged in this matter described him as eccentric. One does not, however, remember the names of those people' (Perdurabo [1974] 1976, p. 187).

Alternatively, expressed with the same circular graphic form as with the other mode families, we would find the following:

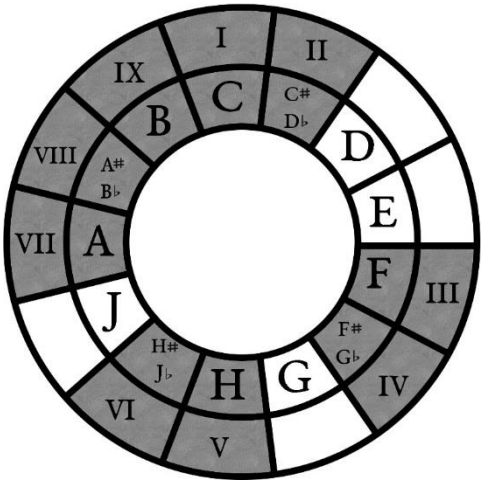

Figure 15: The first 'Vathek' family of modes.

C	C#			F	F#		H	H#		A	A#	B
C	**C#**	D			F#	G		H#	J		A#	B
C	C#	**D**	E			G	H		J	A		B
C	C#	D	**E**	F			H	H#		A	A#	
	C#	D	E	**F**	F#			H#	J		A#	B
C		D	E	F	**F#**	G			J	A		B
C	C#		E	F	F#	**G**	H			A	A#	
	C#	D		F	F#	G	**H**	H#			A#	B
C		D	E		F#	G	H	**H#**	J			B
C	C#		E	F		G	H	H#	**J**	A		
	C#	D		F	F#		H	H#	J	**A**	A#	
		D	E		F#	G		H#	J	A	**A#**	B
C			E	F		G	H		J	A	A#	**B**

Table 6: The First Vathek mode through the 13 tonics (tonic highlighted).

Slight as this change may be from, say, the 'Aftermath' family of modes[35], upon first sounding it out on one of my created instruments, the BP glockenspiel unimaginatively called 'The Bohlenspiel' (see p. 45), its superiority in terms of reducing the 'ouch factor' to my ('Persian-primed') ears was so immediately apparent that I knew I had stumbled onto something that would produce a rich mine of tonal material. Admittedly, it jettisons the previous precept of separated pentachords, but that concept ultimately derives from ancient Greek and Byzantine thinking, and stimulating as these models are, as Feyerabend (1975) stated, 'given any aim, even the most narrowly "scientific" one, the non-method of the anarchist has a greater chance of succeeding than any well-defined set of standards, rules and prescriptions' (p. 195). It was time to take a great leap into the unknown …

[35] In fact, nobody seems to have yet noticed that one may easily obtain it graphically by simply turning over the picture of the 'Aftermath' modal circle. I only noticed it myself in revision. Never mind – it works. I place myself under the protection of Feyerabend and defend my right to blunder to a conclusion which is perfectly obvious later on!

2.3.5 Five Thousand Modes?

It is self-evident that the Vathek mode may be 'rotated' about the circle in the same way as the other families to produce a whole family of modes (as per Figure 15). These will be practically unexplored in this exegesis for the simple reason that my hands have been full enough as it is; other researchers may choose to continue this. There is no particular reason to confine a single three-semitone step to any one position in the mode/scale; as noted, Kees van Prooijen used them extensively in his different approach to BP, which resulted in a seven-tone scale. However, if one chooses to employ a single three-tone interval in a nine-note mode/scale while retaining an allegiance to the BP expressions, enormous amounts of new musical material become available—a rough calculation suggests possibly around 5,000 new 'modes'.

If one accepts certain constraints, the number narrows considerably, but even so, assuming for example that a single note is always to be kept between each of the three intervals—one three-semitone and two two-semitone—to preserve their character, there are 14 possible permutations. Each of these may exist in 13 permeations within the chromatic BP scale (including several that may be 'undesirable' due to starting, say, on a gap as a 'tonic'), and with those permeations the mode can of course start on any of 13 possible 'tonics'. Thus, 14 x 13 x 13 = 2,366.

In such a thickly grown forest of unknown species, it seemed best to begin with those closest to hand. I therefore decided to start work on the basis, at least provisionally, of a detailed exploration of the first Vathek mode.

2.4 CONTEXT OF THE STUDY

And so it was that in early 2015 I began work on the Doctor of Creative Arts program. The research question has already been given; my broader goal was to explore it in the context of ultimately creating a final body of musical pieces that would be informed by practice-based research conducted along the way, and that would contain useful theoretical observations as well as at least some degree of æsthetic merit. A portion of the background research that was conducted to determine the conceptual basis of the final works has already been reported on at length. The philosophical context—'Feyerabendian' and 'Pyrrhonic'—has been discussed. This approach of avoiding dogmatism and following observations wherever they might lead is also in the spirit of practice-based research, about which an extensive body of literature already exists (see my quotations from some of this in Section 3.2).

As far as the final form of the work or works went, I was influenced by my previous work in xenotonality, which was undertaken before even entering university as a (very) mature-aged student. One of the outcomes of this earlier work was an album—not created on a BP basis—of what purported to be 'ancient Lemurian music'. This album, *Lemuria! (Songs from a Sunken Continent)* received limited release on the Melbourne-based Shame File Records label in 2008. It also achieved limited national and international airplay, and even the privilege of two reviews, the first of which

proclaimed it an esoteric and instant 'cult' masterpiece, while the second proclaimed it a piece of something else altogether.[36] Unfortunately, the second journal, which specialised in the review of 'electronic dance music', had a massively larger circulation than the first. Their thoroughly dismissive opinion may perhaps have been influenced by the more-or-less affectionately teasing tone regarding 'New Age thinking' displayed in some of the tracks; the final number, 'Hypnobruxism (Salvation of the Witless)' is a parody of 'meditation music' in which the listener is invited to take an imaginary voyage 'back' to their 'previous incarnation' as a Lemurian. In the course of this journey, the listener is enabled to 'retrieve' their knowledge of the three 'Lost Sonic Arts of Lemuria'. In order, these are revealed to be the Art of Levitating Stones, the Art of Contacting Nature Elementals, and the greatest and most secret Sonic Art of all: the Art of Curing Haemorrhoids with Sound. The piece is also tuned to multiples of brain frequencies that correspond to a passage from sleeping to alert wakefulness; it terminates abruptly with advice from the speaker that the listener has now been 'subconsciously' cured of their stupidity and retrained to not believe everything they hear—'especially New Age crap. WAKE UP!'

The reason for the choice of Lemuria—an imaginary sunken continent that was supposed to have existed in the Pacific Ocean in various locations—was that the more 'recent' and rather better known imaginary sunken continent of Atlantis has been pretty well covered in New Age circles, and there is already a plethora of 'Atlantean' music available in this particular marketplace.[37] Entertaining as the Lemurian voyage was, it left an even older and more esoteric imaginary sunken continent entirely uncharted. And this is the location to which we must now voyage …

[36] 'Haunting, infuriating, trance-inducing, disturbing, pretentious, amusing, hermetic—*Lemuria!* never fails to evoke a myriad of responses from the listener. As a consequence, dolts and oafs need not apply for admission through these gates. However, for the musically adventurous *Lemuria!* is well worth your time and investment' (Van de Kree 2008, para. 1).

[37] Astoundingly enough, even the material that purports to have been 'channelled' directly from 'Atlantean' musicians almost always seems to be performed on synthesisers tuned to 12–ET and essaying few greater innovations than ventures into pentatonic scales.

Part 3: Confusion (Fossil Sounds)

> For me, however, the present confusion about notation is highly welcome, since it shows clearly that conventional methods of notation are no longer adequate.
>
> Erhard Karkoschka, *Notation in New Music*

> He who knows he is a fool is not the biggest fool; he who knows he is confused is not in the worst confusion.
>
> *Zhuangzi: The Outer Chapters*

3.1 THE INSTRUMENTS

> The first act in proving that one's purpose is to excite *musical* brain action, as well as the usual kind, is the preparation of an experimental musical instrument.
>
> Partch, *Genesis of a Music*

3.1.1 On the Need for, Construction of, and Use of Diverse Instruments

Partch had a point here as far as '*musical* brain action' is concerned. While I appreciated the almost infinite variety and adaptability offered by the Max/MSP audio-visual programming application that I had been using extensively in undergraduate study, I had also been working on the development of acoustic and electro-acoustic instruments, and I wished to continue doing so. In a sense, Max/MSP was *too* easy to use; some sort of sonic result was always achievable, to the extent that I was finding it increasingly difficult to assess whether I was actually making any real progress in theoretical as distinct from sonic terms. 'Real' instruments, I thought, would be subject to the possibly inexorable laws of physics and, to that extent, would offer immediate feedback on whether an idea 'worked', at least in that sense.

I am about to take the reader on a short tour of my instrumentarium, but a couple of points still need to be made. I conceived, designed and constructed or adapted such instruments as I felt I needed at the time. My major practical written aids were Helmholtz and *Musical Instrument Design: Practical Information for Instrument Making* by Bart Hopkin (Hopkin [1996] 2010). I strongly recommend the process of practical instrument-making to every xenotonalist who wishes to put their theories into practice. Much can be learned from even partial or complete failure. However, in my case, as I went along with practical musical work, I found the electro-acoustic instruments generally to be less and less useful for the purposes I had in mind, except for the special use they were finally put to in creating the 'sacred' music of the three subcontinents. In the final works accompanying this exegesis, they will be found to play a smaller role than retuned sample-based instruments. This was not my original desire or my intention, but as I went along, I found it was the only way I could make any practical progress, and although I was not exactly doing 'practice-led research', it is still worth noting that it is sometimes about being led *away* from some things. Nevertheless, as the instruments

always attracted more attention and commentary than the *music* ever did, I will offer a short guided tour in approximate order of construction.

3.1.2. The Paddlemelan

Figure 16: The Paddlemelan, with Protong in front and cat on top. (Cat not included in standard version.)

This instrument, seen here behind the adapted guitar known as the Protong (see p. 44) was constructed in 2015 as a percussive device for use in the Honours year. In Hornbostel–Sachs terms it is a plosive aerophone (category 413). The design was arrived at in consideration of the early view that odd-order harmonics might be preferable in the expression of BP music; I noticed in reading Chapter V of *Sensations of Tone* that Helmholtz mentioned in discussion of organ pipes that 'the *narrower stopped cylindrical pipes* have proper tones corresponding to unevenly numbered partials of the prime, that is, the third partial or Twelfth, the fifth partial or higher major Third, and so on' (Helmholtz [1885] 1954, p. 94, emphasis in original). This observation, repeated by Hopkin ([1996] 2010, p. 74), led me to attempt construction of a plosive aerophone of my own along the lines given in Hopkin's discussion of this instrument type (pp. 85–87). It has 12 PVC tubes closed on the undersides with plywood stoppers glued permanently into place. These are tuned to equally tempered BP notes from a low C to the B above. The tubes are suspended in a frame of scrap wood and played by rapidly placing and releasing the large paddles on the right side of the instrument over each open tube mouth.

Some practical observations: while this instrument worked well enough in practice, producing an appealing sort of tuned hollow boom, it suffered from (among other things) a common failing of acoustic instruments—it is subject to variations in tuning according to ambient temperature. In its early form, the large tubes rested on small PVC crosspieces that were glued onto the tubes and held in place on the frame by short aluminium T-bars that were covered in felt to reduce noise. Neither this nor the crosspieces worked—there was a constant and very irritating clacking sound as each tube jumped in its restraints while being struck and then landed again. After much breakage and foul language—and after testing for possible tuning disruption with a prototype—these were replaced with lengths of bungee cable held in place by knots inside the tube and beneath the frame, after large holes were drilled to accommodate the cables. This proved so satisfactory that a larger and better prototype with a two-tritave range was being planned when it became apparent that in the course of the doctorate it would be necessary to investigate several different tunings within BP. The Paddlemelan is more-or-less committed to a single specific tuning, unlike the more pliable percussion synthesisers now available, and so this project was put aside, as the Paddlemelan itself has been to a very large extent.

3.1.3 The Protong

Figure 17: The Protong.

This instrument is a cheap Chinese semi-acoustic kit guitar that was constructed as an accompaniment for the Paddlemelan in the Honours year (see Figure 16). It differs in no respect from a million other instruments of its kind, other than in having been refretted in the system used by Bohlen to adapt an acoustic guitar in 1997. I generally followed the instructions given on The BP Site (Huygens–Fokker 2011, table at para. 24), but where Bohlen used the first 10 frets, I added 14 for a full tritave range. Thus, this instrument was in equally tempered tuning once again, as the frets ran straight across the fingerboard, but as I have already mentioned (p. 37), the overall difference between the respective fret placements of this and a hypothetical just-tempered version is some 1.4mm, with a maximum difference of about 4.5 mm in one instance on one string. How far this difference is even significant in terms of the maximum achievable accuracy of the human fingertips is a question that is still open.

In practice, the Protong holds its tuning reasonably well, considering its price point. It is probably one of the more intonationally accurate physical instruments at my current command. It is generally, although not always, used in either the tuning indicated by Bohlen for his guitar (A1 C2 E2 G2 A2 C3) or one of my own preference that matches the initial tension of most guitar strings more closely (A1 C2 F2 H2 A2 C3). The latter is perhaps less sonically flexible, but it potentially economises on replacement strings (although there is little in it). It seems best to play it with a brass slide and often an eBow—the action is very high and difficult to adjust, and I did not do a very good job of trimming the sides of the new frets, so finger-picking must be done with some care until I get around to filing them further.

The timbre of an electric guitar (or even a semi-acoustic like the Protong) is a ferociously complicated subject, even before questions of amplification, effects and production are introduced, but my overall experiences with this device are consistent with those reported by Bohlen: 'When Heinz Bohlen, in 1997, refretted an acoustical guitar to BP, he found that the instrument didn't sound strange, despite the now unavoidable even harmonics'[38] (Huygens–Fokker Foundation 2011, para. 9). I regard this observation as possibly an important support to my (very guarded) practice-based 'conclusion' that strict adherence to odd harmonics—even if practically achievable—may be of less importance to effective BP music than was at first thought. The stickers visible in the illustration are removable temporary fret markers for one Vathek mode in one tuning, as I make no claim to have memorised them yet.

[38] The luthier and guitarist Ron Sword has conducted some interesting work in this area (https://ronsword.bigcartel.com/product/creative-applications-for-polyscales-and-scale-sequences, viewed 16 December 2019).

3.1.4 The Bohlenspiel

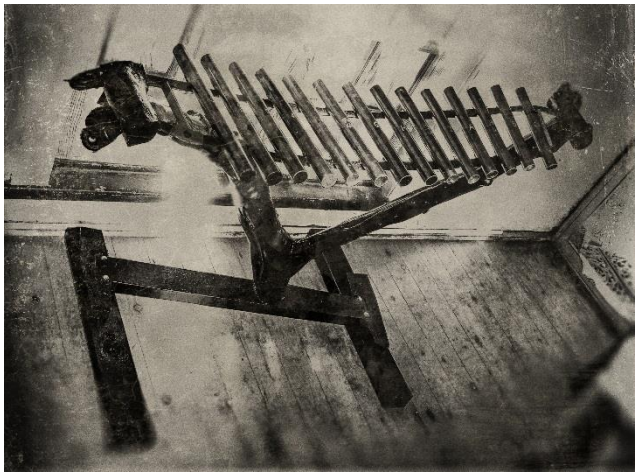

Figure 18: The Bohlenspiel.

The Bohlenspiel is a glockenspiel constructed out of 14 tuned lengths of copper plumbing tubing. They are suspended by bungee cords threaded through holes in the wooden frame. The tubes are held in place on the bungee by Velcro patches, and it is played with the usual sorts of mallets. The tuning is the same as the other instruments: in a tritave range from C4 to C5.

Altogether, this is one of the most effective instruments, probably because it is one of the simplest and most robust. It has found much use simply stretched out on the floor on its bungee cords, often to test out ideas with instant feedback or as an effective means of demonstrating the basic principles of the BP scale, as in this illustration of my answering audience questions following the performance of the Spectral Om Ensemble at the Electrofringe Festival in Redfern, Sydney in 2018. Because of its simplicity and robustness, and perhaps because of its similarity to childhood instruments, the uninitiated seem to find it less intimidating to try out than the other instruments.

Figure 19: The Bohlenspiel, sans frame, being demonstrated by the author at the Electrofringe Festival, Sydney, 2018. Terry Buckridge in background with Pujol. Not shown: Corin Shearston. After a photograph by Kimberley Bianca.

As with the other instruments above, the Bohlenspiel is committed to a single fixed tuning; as such, it has only proven useful for the portions of this work where an equally tempered system in Bohlen's original tuning is employed.

3.1.5 The Pujol

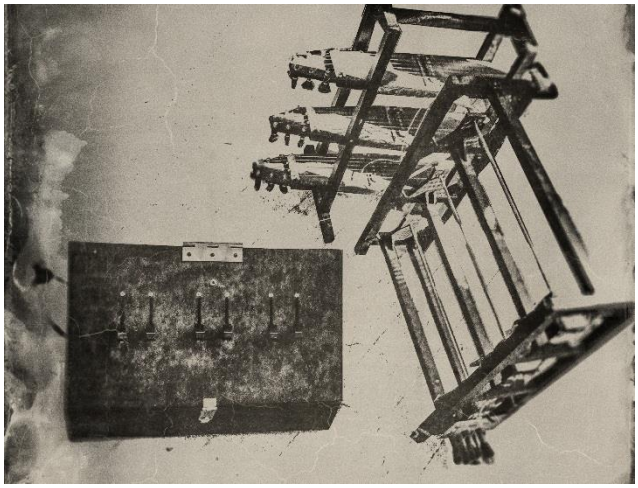

Figure 20: Pujol (eighth prototype).

The Pujol's placement here is somewhat anachronistic, as the version pictured is perhaps the eighth prototype of an instrument that I have been working on since undergraduate days. Essentially, it is a means of bringing an Æolian harp indoors and making it controllable, or semi-controllable. The large box to the left contains a customised electronic controller, created from my concept by the very gifted Dave Pike. From a 240V AC motor cannibalised from a defunct computer, the electronics transform the current to 9V DC and pass it along to the small electric motors visible in the frame at lower right. The two controls for each of the three motors determine the speed of the motor and its 'chaos', or induced capriciousness of flow, to resemble the vicissitudes of a breeze.

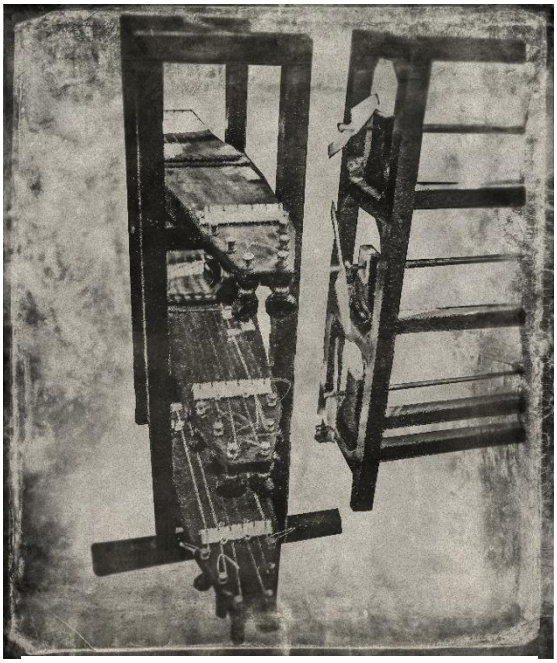

Figure 21: Pujol (closeup of propellers).

From each of these motors a long brass shaft runs to a drone propeller at the other end of the frame. These propellers, mounted in a reversed 'pusher' configuration, then blow airstreams over each of the harps in the separate frame at the top right. The small switch that is visible above the middle pair of sliders on the control box makes all of the motors a slave to the controls of any single motor when actuated; otherwise, each motor is controlled independently.

Figure 22: Joseph Pujol. (Original artwork incorporating 'Hephaestos' (2003).)

The airstream over the harps of the Pujol, like its 'acoustic' predecessor, the Æolian harp, only produces harmonics from the strings. These are either tuned in unison on each harp—usually to create a triad of various sorts across the three harps—using strings of different gauges, or in rarer cases, they are tuned to different notes across each harp using strings of the same gauge. The effect is similar to that of the Æolian harp, creating what Coleridge memorably described in his 1795 poem *The Eolian Harp* as 'a soft floating witchery of sound'. This of course can be in any tuning desired. The instrument is named in remembrance of the pioneering French sound artist Joseph Pujol (1857–1945), who also used semi-controlled streams of air to create

his inimitable effects. I would not care to guess which Hornbostel–Sachs classification it might possibly attract.

This instrument has been used in the Spectral Om Ensemble's live appearances, but in recent years it has proven more expedient to operate it by means of airbrushes run by small hobby compressors, as this creates a much stronger signal. It has also been used with large electric fans, but again, these tend to create signal interference. Work to improve the current prototype is therefore continuing, when funds permit, and it is hoped that this instrument will soon be able to realise its considerable potential.

3.1.6 The Kumbhira

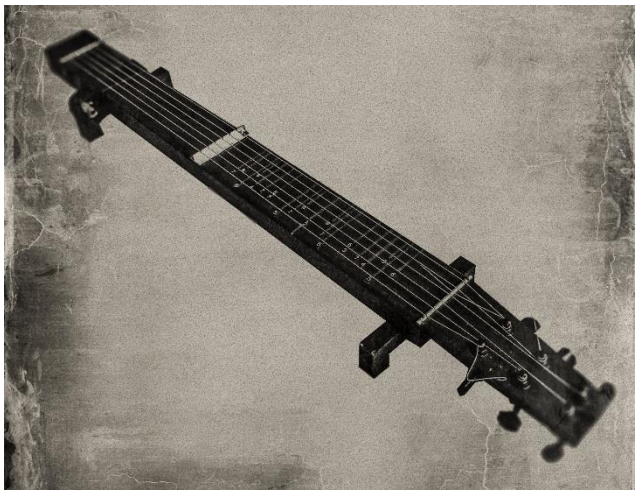

Figure 23: Kumbhira.

This device was a prototype for a harp for a proposed new Pujol. It was intended to overcome the deficiencies of the current harps, particularly in their tuning, as the no-frills mandolin tuners that are used on current harps have proven inadequate in both achieving and retaining a desired pitch. The no-frills guitar tuners of the Kumbhira are a very considerable improvement in this respect, as is the 'Duncan Designed' pickup at the rear of the instrument, which was salvaged from an upgraded conventional guitar.

The central bridge of this instrument should be noted. This is not present on the existing Pujol harps, and it is necessary to put the Kumbhira into a 'three-bridge guitar' configuration. This instrument, credited by Hopkin to Glenn Branca, 'does very well at isolating tones high up in the harmonic series' and 'just plucking the string and sliding the steel over its length produces a cascade of audible pitches ... clean and lucid, with no plucking sound at all' (Hopkin 2010, pp. 12–13). The governing principle is that the strings are plucked (or otherwise actuated) on the side away from the pickup. Presumably the central bridge should also suppress the production of the first, even-order harmonic, whence the testing of the idea here. The applicability of this to airstreams directed on the strings is still to be determined in detail, but as things presently stand, the Kumbhira has been played as an instrument in its own right in various situations by airbrush, brass slide with finger-picking, found objects and eBow, with generally satisfactory results.

3.1.7 The Zigura

This is an electric lyre converted from an ancient short-scale bass in response to a perceived need for an instrument of this class. It has 10 strings—now guitar strings rather than bass—and arms of round hardwood dowel. The strings run through the former bass body through newly drilled holes; there are 10 to allow for a full expression of the 10-note Vathek modes on this instrument.

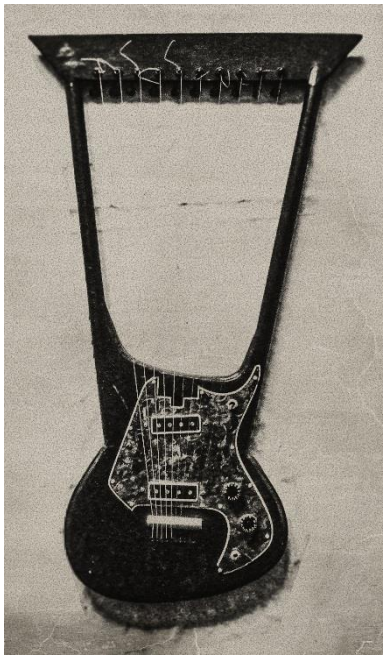

Figure 24: Zigura.

Unfortunately—and again due to extreme lack of funds—the crossbar was constructed of a lamination of construction-grade ply on the assumption that it should be able to sustain the string tension. This did not prove to be exactly the case, and the bar has now visibly warped. Still, since the total monetary cost of the conversion project was about $15 (and most of that went on hardwood dowel), I suppose I should not grumble too much about the outcome. It has a nice sound, as far as it goes, and it is still usable in short bursts.

3.1.8 Other Instruments

I have also used a number of other instruments that have not required adaptation, such as an electric violin, a fretless bass and fretless guitar, an AKAI EWI USB wind synthesiser, a small zither and a cello. None of these instruments differ in any way from their more conventional brethren except in tuning, and it is not necessary to describe them at length or illustrate them.

3.2 LARAMIDIA

Figure 25: Laramidia, showing North and South Appalachia to the right and the island of Laramidia to the left. Pratiśruta Cave is indicated by the red arrow-like banner at lower left. (Original artwork using the 'Inkarnate' fantasy map generation website (https://inkarnate.com), with additions.)

The reader is now invited to imagine themselves as a resident of the continent of Laramidia, a form of the North American continent as it existed in Cretaceous times. The reader is further invited to imagine that, along with the dinosaurs, a race or species of non-human intelligent life co-existed with the dinosaurs. These creatures, known as the Laramidians to us, called their homeland Plaksha. The three islands which together constituted Plaksha as shown in this map, which were inhabited and abandoned successively by the Laramidians, were known by them as Suloma, Sūrmi and Praśāsitr respectively. Details of the culture of these islands and its interplay with the forms of music must be sought in the entry in Appendix A1 which corresponds by name to the forthcoming unique entry for each of the seventeen tracks. It was and is the intention of the composer that the sonic and the cultural material should be apprehended as a single whole.

The seventeen tracks created for this project are supposed to be relics of the actual music of the Laramidians, generally recreated by working backward from the sonograms supplied for each track. These are supposed to be actual depictions of the music impressed by unknown means on the walls of a recently discovered cave in a remote site in Utah. They were deposited by the Laramidians at the end of the Cretaceous as a record of their society and a warning to the future. Further details of this warning can be found in Appendix A2.5.

References in this section of Part 3 to 'Jāgand Mara' and 'Zibethicus' refer to quasi-fictional entities who are supposed to have 'assisted' in the 're'creation and interpretation of this music. Jāgand Mara is an 'Ascended Master'; a species of immortal 'adept' who usually inhabits an invisible 'astral city' in the Himalayas and, together with other Ascended Masters, secretly directs the evolution of humanity towards Higher Consciousness. (Unfortunately, Jāgand Mara's sojourns in this material world, replete with temptations as it is, sometimes lead to his sleeping it off in the drunk-tank when he is supposed to be 'channelling' this information to people like the equally-dubious 'ArchD'Ikon Zibethicus Zenzizenzizenzic the Zetetic'.) While all of this fictional framework is ultimately derived from Theosophical sources which are given in Appendix A1, the Theosophists themselves cannot be held responsible for my own creative efforts such as the imagination of Laramidia and the invocation of Jāgand Mara – who is not on the Theosophical list of accredited Ascended Masters! – and no special knowledge of Theosophical concepts is necessary to apprehend this music.

3.2.1 'Grāvā'—Sulomian Folk (Track 1)

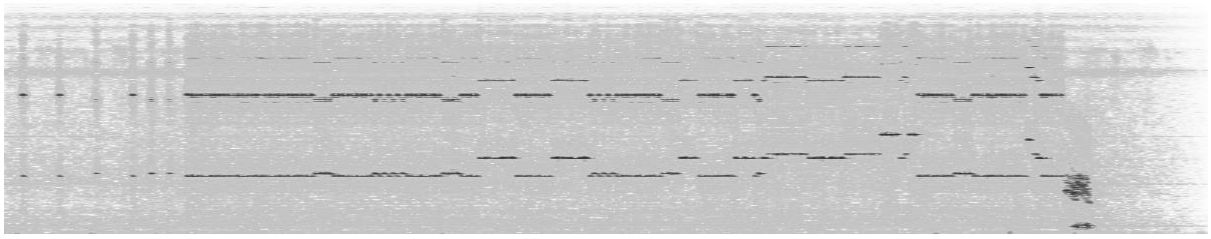

Figure 26: Grāvā (sonogram).

Well, I always wanted a lithophone, you see ...

And I could never get around to making one, but the 'boutique sample' firm Soniccoture saved me the trouble in the end, as they released a sample set of the 'Musical Stones of Skiddaw', a 61-note lithophone created over a 20-year period in the nineteenth century. I waited until they announced a half-price sale and promptly pounced.[39]

This was actually one of the last tracks produced, in late October 2019, as I knew I wanted to open this project with a track of precisely this nature and had been waiting for the sample set to go on sale. Consequently, the track was produced using my preferred method of retuning notes in Logic Pro X. This allows one to manually retune each note in the chromatic octave to +/– 99 cents by entering a given value in the relevant area of Logic Pro X, which permits global retuning of the entire project. Normally this is a somewhat elaborate undertaking, but as I was in a hurry and wanted the fastest and simplest method, I chose to retune five BP modal notes that all fell in the same 12–ET octave, beginning with C3 to their nearest BP equivalents. Given that I was working in E in the first Vathek mode, these were C#–E2 (–22 ¢), D–F2 (+24 ¢), G–H2 (–37 ¢), G#–H#2 (–10 ¢) and B–A2 (–2 ¢).

If I was working over multiple 12–ET octaves, the retunings would have to be entirely redone in each octave, as the BP scale in either its equally tempered or just-intoned versions does not achieve a consistent mapping by frequency with the repeating 12–ET system. Hence, by design, I remained with a single instrument in a single 12–ET octave. Notes were entered in the piano roll section of the Logic Pro X application. An advantage of this simpler system was that I could already hear the effect of the retuned notes as I worked, whereas in more complex systems, multiple renderings of each BP track by 12–ET octaves must be heard together for the full part or piece to be perceived. The track is a desperately simple little auditory doodle that comes and goes blessedly quickly.

To create the ambience of a tropical creekside, I took an appropriate field recording from the Freesound public domain repository ('spiid' 2016) and ran it through a 'mutated' filter in the Native Instruments Absynth 5 virtual synthesiser to create an impression of digetics in the Triassic environment, when, if a human was present and listening, things would sound differently to the present day owing to the different composition of the atmosphere. The animal sound at the end really is a virtual stegosaurus, obtained from the same Freesound repository ('WASasquatch' 2016).

For further information the reader is directed to the corresponding entry for the track at Appendix A2.2.1.

3.2.2 'Madyhapatita'—Sulomian Folk (Track 2)

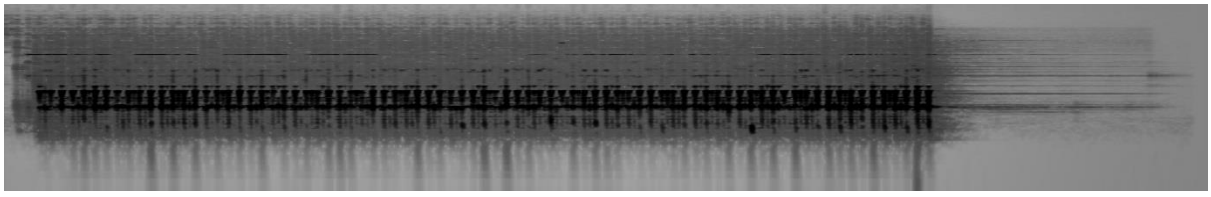

Figure 27: Madyhapatita (sonogram).

[39] http://www.soniccouture.com/en/products/26-percussion/g4-the-skiddaw-stones/

Despite its many imperfections, I have chosen to retain this track in the final works for a variety of reasons. First, it represents some of the earliest stages of the creative output for this project, dating back to February 2016. It is one of my early pre-Vathek attempts to incorporate classical Byzantine music concepts into BP theory, influenced by the work of John Chalmers in his book *Divisions of the Tetrachord* (Chalmers 1993). A diatonic 'scale' or 'mode' in the 12–ET scale with a tonic of C (C D E F–G A B C) was mapped somewhat arbitrarily into BP, also with a C tonic, as C D F F# G–H J A# B C.

The piece is simple in form and short in duration. Rhythmically, this track is based on African and Asian polyrhythms as found in Matthew Montfort's (1985) book *Ancient Traditions—Future Possibilities*. It also reflects an interest in the 'Euclidean rhythms' articulated in 2004 by the late Professor Emeritus Godfried Toussaint (Toussaint 2005). These seek to combine disparate rhythmic elements in such a way as to make them as equidistant from each other as possible. The second reason for retaining this track is that it uses the physical instruments I built for this project; the Paddlemelan plays the lower part of the tuned percussion, the Protong takes the simple melody line, and the other parts were created by handclaps and miscellaneous found objects, including plain metal rods cut and tuned to BP notes.

The third reason for including this track is personal. In early notes of Bohlen's from 1972, which I translated into English for the first time as part of my Honours documents, Bohlen explained that part of his motivation in scale research was a dissatisfaction with the current state of avant-garde music, which was somewhat dominated at the time by total serialism. To paraphrase Bohlen, such music can frighten, excite, stimulate or repel, but one thing it *cannot* do is 'play a happy little tune' (Bohlen as cited in Holmes 2015, Appendix C, p. 40). Bohlen felt that his new scale offered exploratory musicians an opportunity to 'start again' with truly new tones rather than combining existing tones in ever more elaborate and abstruse ways, in order to avoid repeating simpler melodies that had already been written.

When I listened to the total corpus of material that had accumulated by mid-2019, I was struck by this early track, which I had frankly forgotten about. It seemed to be striving for Bohlen's 'happy little tune', and to that extent it reminded me of certain types of Central African music, although that was certainly not an effect I was consciously aiming at. So it has been left here, partly to testify that BP can indeed play 'a happy little tune' when it is in the hands of happy musicians. Much of the rest of this material was created under far less felicitous conditions...

For further information the reader is directed to the corresponding entry for the track at Appendix A2.2.2.

3.2.3 'Nagodara'—Sulomian Folk (Track 3)

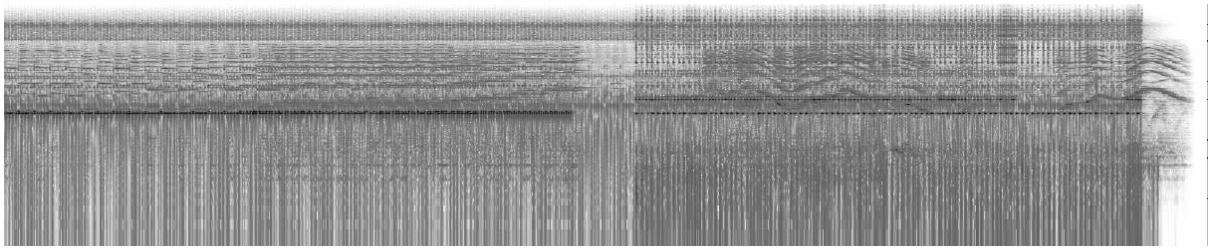

Figure 28: Nagodara (sonogram).

This track is a development of the principles of the previous one. It is quite similar in rhythm and tonality but slightly more elaborate melodically. Note the presence of the bittersweet tones of the Protong. Proficiency in expressive improvisation on instruments of this nature was a highly valued skill in all Laramidians at all times. According to Jāgand Mara, artwork associated with this instrument implies that it was fashioned or conceptualised in relation to the calls of certain pterosaurs.

In the first half of the track, the tuned percussive elements play a B and an E in what appears to be a 'triadic' or heterophonic exercise in which the tonality is reinforced by the Protong. In the absence of surviving detailed notes for this project—which was originally intended as an exercise in layering 'Euclidean' polyrhythms—I am unable to state with confidence precisely what tonality was intended. This track dates from March 2016, and it is interesting to see that it was achieved by individual retunings of software synthesisers with that capability, one track at a time, rather than the 'global retuning' method subsequently discovered.

This track also predates the discovery of the Vathek modes a few months later, and its tonal approach is again likely to be more indebted to Dr John Chalmers' *Divisions of the Tetrachord* (Chalmers 1993). After a dropout of the Chromaphone-based instruments in the middle of the track, the 'harmony' or heterophonic melody is taken up by three metal bowls tuned with water—real instruments, not samples. These express a 'triad' in A#–J#–F#, and so I suppose it is licit to speak of a 'key change' or a 'modulation', which is of course also adopted by the Protong.

All in all, the way this track works is now something of a mystery to me, to be completely candid, and I suppose I should have kept better notes, although as I said, this was not intended at the time to be a final track. Nevertheless, it seems to belong with the other material in practice, and I like it, so I leave it here along with whatever material I can adduce to help with its interpretation.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.2.3.

3.2.4 'Krāntipātagati'—Sulomian Courtly (Track 4)

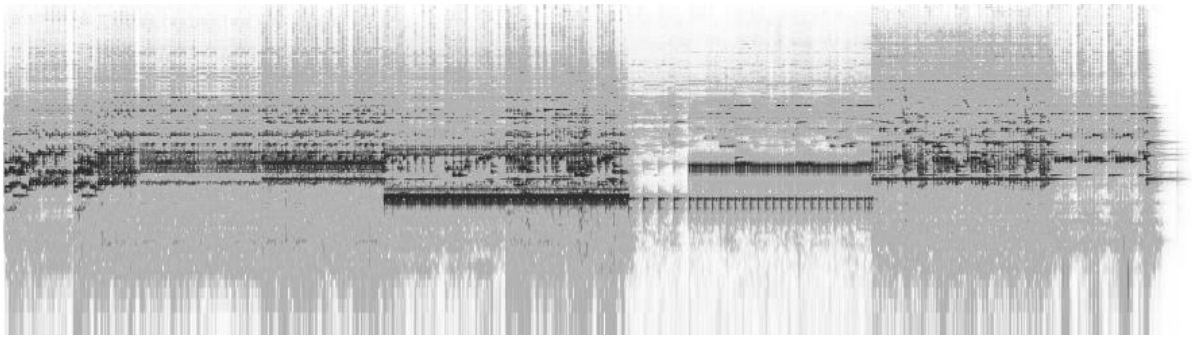

Figure 29: Krāntipātagati (sonogram).

The piece is overall in the Vathek C mode. It has been recreated using the Mus 2 software, which is an elegant application intended for the creation of Turkish classical music but fortunately flexible enough to be able to cope nimbly with this unintended use (http://www.mus2.com.tr/en/). Notes and rests are entered one-by-one directly onto a virtual score sheet that may be customised in many ways. The sampled instruments contained in the application—mostly strings, winds and drums—may be considered to correspond nearly enough to the Laramidian originals. The piece is in five main sections of approximately equal length, in a fast 'cut time' of 2/4. A 12-bar introduction at a tempo of 150 bpm states a simple ascending melodic figure and repeats it, doubled, in tritaves. A 32-bar 'first strain' section at 120 bpm then states an eight-bar melody and repeats it in a pianissimo, which grows to a mezzo-forte. This repetition is then itself repeated with a simple accompaniment in lower strings. This ends in an arpeggio, which leads directly to the second strain. There is no denying that this section, crude as it may seem, has a certain insouciant charm.

In the second strain, the same process of dual repetition of the melody occurs, but the new melody is transferred to the lower register of the strings, and it is developed over 32 bars. The higher strings now serve as an accompaniment, the whole accompanied by a gentle tuned percussion akin to a marimba, and such development as there is in this section takes place entirely in the melodic part and over a single repetition. A short trio then succeeds as the third strain; this is delegated to two wind instruments and the 'marimba', and it is fair to speak of it as 'modulating' to what might be considered a 'subdominant' in common-practice harmony. A repetition with variations (and quieter upper wind) of the 16-bar melody is expressed with a certain degree of deftness.

The finale or fifth strain sees a return to the use of stringed instruments, although the 'key' or 'mode' remains in the 'subdominant'. The instruments are much bolder and louder, and a counter-melody is employed in the lower strings, mostly but not exclusively in a contrary direction. The percussion is more brash, and the illustrations accompanying the sonogram seem to suggest it was played on metallic gongs. We have done our best to approximate this sound using the excellent and appropriately retuned Chromaphone 2 percussion synthesiser. An interesting feature of the percussion in this section is that the fast part actually 'precesses'. The rhythm in this section is once again Euclidean. The fastest gong part has a break in the pattern that 'moves' backwards once every succeeding bar. According to the accompanying artwork, this marked a stage of the march in which the Laramidian dignitaries leapfrogged backwards over each other to mark the precession of the stars, which is made apparent by the change in the axial tilt of the Earth over long periods. The ritual sternly called for the participating Laramidians to retain their circular form in honour of the celestial objects

they were representing, but they also wore elaborate ritual costumes. The spectacle of giant translucent sacs of semi-astral matter psychically 'bouncing' over each other while arrayed in costumes as elaborate as those assumed by the free jazz musician Sun Ra (1914–1993) and his Arkestra might seem amusing or even grotesque to our eyes, but this would be an act of serious xenocultural miscomprehension. The Laramidians took the ritual extremely seriously, and their joy at the assurance of the regularity of the cosmic order, which was created by the correct performance of this ritual, was always tempered by a profound sense of its solemnity. Even if we cannot share this apprehension, we should at least respect it.

It is somewhat remarkable that this piece, which was modelled on the general principles of an American military march of the time of Sousa, was partly based melodically on a transposition of a melodic line from an eighteenth-century French popular song, 'Ah! vous dirai-je, maman'. This work was well known enough at the time to have been the subject of variations by Mozart, Bach, Liszt and Saint-Saëns amongst others, and it still exists as a nursery song today. Despite this, the fairly explicit quotation of the line in the finale has so far completely escaped detection by all of the formally trained musicians thus far exposed to this piece. However—and despite its transposition into BP—it was immediately perceived by a rock musician who happened to hear the piece casually. As the Mus2 application permits the output of sheet music modified to the user's requirement, even to the extent of being able to express Op de Coul notation, the curious may seek the quotation in the score for this piece, which is given in Appendix D.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.2.4.

3.2.5 'Mārgaśodhaka'—Sulomian Courtly (Track 5)

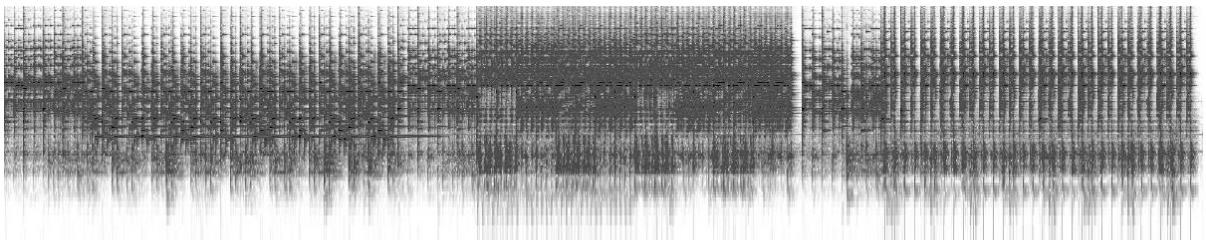

Figure 30: Mārgaśodhaka (sonogram).

This piece appears to be an exercise in modal heterophony. What would be thought of as the 'fourth mode' of the Vathek scale, when the 'tonic' is D, yields a mode/scale of D–E–F#–G–H–H#–J–B–C. (The three-semitone interval is now between the J and the B.)

This system includes some 'quartertones' on the notes B, C, D and G. In this rendition, they are achieved by calculating the mean distance in cents between two BP notes. The division between these in the equally tempered scale is 146.3 cents; thus, a 'quartertone' in this system is 73.1 cents. Calculating this interval is a logarithmic process; for example, in my 'standard' system, the BP B1 is 97.59 Hz and the next note 'above' it, C1, is 146.3 cents away at 106.20 Hz. The median interval between them is 73 cents 'above' B1, at 101.80 Hz. One might think of this as 'B1.5'. The other quartertones can be found on one of my sheets of notes:

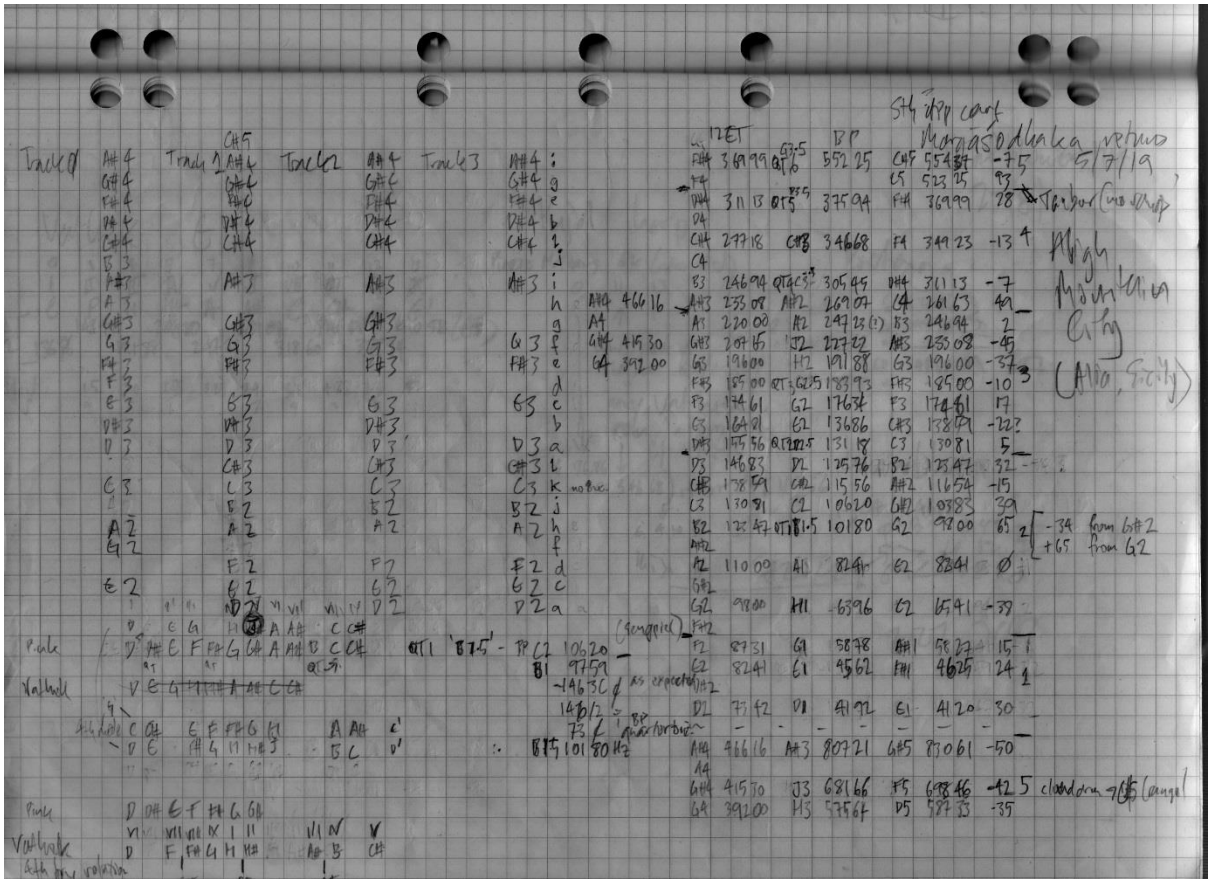

Figure 31: Mārgaśodhaka working notes, July 2019.

The column of figures at the far right of the page relates to an alternative BP tuning system that was employed for the middle section. While this is equally tempered like the standard system and shares a 'crossover frequency' of 82.41 Hz with the 'Bohlen tuning', in that tuning 82.41 Hz is allocated to the note A1, and in the alternative tuning it is allocated to the note E2. The values of the other notes change accordingly.

This track was rendered as a quartet, with each instrumental voice being rendered three or four times in succession in different 12–ET octaves, according to the range of the specific instrument. Two of the instruments—the kanun and the tanbur—were again taken from the Native Instruments 'Discovery Series: Middle East' sample set. Percussive sounds were provided by the Chromaphone 2 percussion synthesiser and the Cloudrum application produced by Ample Percussion.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.2.5.

3.2.6 'Pavanamāyā'—Sulomian Sacred (Track 6)

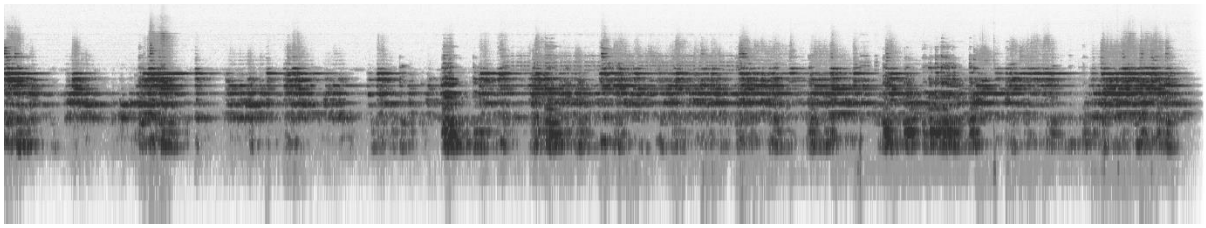

Figure 32: Pavanamāyā (sonogram).

This piece represents a practical manifestation of the Pujol (see pp. 46-47) in action. Unless the harp array is changed, the Pujol cannot differ in real time from its selected tuning; all it can ever do is produce harmonics on the strings in various tunings. Given the poor state of my notes on this track, it is difficult to account for the clear change in the basic notes at around two-thirds of the duration of the track without supposing that this track was not performed in real time. In fact, on reassessing this track during preparation of the final deliverables (December 2019), I had a fairly distinct recollection that it was created by placing these instruments outside the house on a particularly windy day, with long cables leading back to the interface inside. A snapshot of the Logic Pro session for the track reveals that it was collaged from a number of overdubbed takes of the Pujol and the Protong, with extraneous empty time removed:

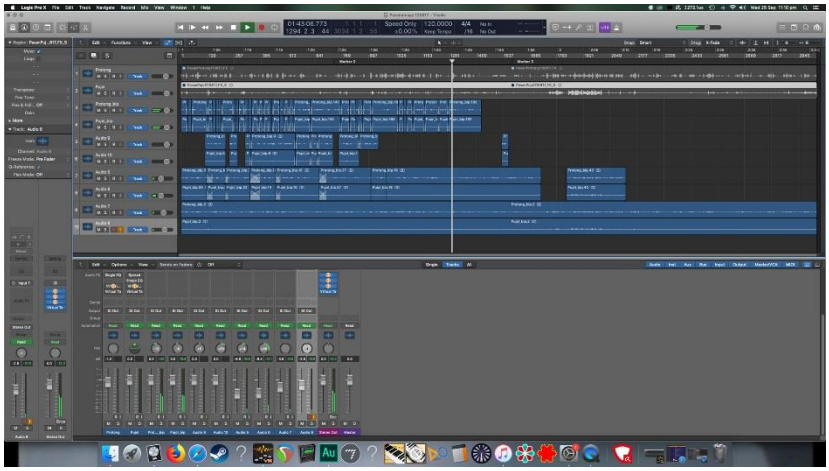

Figure 33: Pavanamāyā session screen shot.

This accounts for the change in tonality. It would appear that all of the notes were drawn from a subset of the Vathek C mode in standard tuning—C–C#–F–F#–H–H#–A–A#–B–C, in the tritave C4 (318.60 Hz)—C5 (955.80 Hz), but due to the imprecision of the available sonogram, I would not care to be drawn into a definitive statement as to which notes are being used in each case. The piece is worth retaining as a testament to the potential of the Pujol—indoors or out!—and also to make the incidental observation that there is nothing in the design of the Pujol harps at present to discourage them from expressing even-order harmonics (the central bridge of the Kumbhira was intended to address this 'problem'). Thus, if this piece is judged as being acceptable in a BP context, it may provide evidence against the theory that a strictly odd-order harmonic structure is always necessary in BP music. The piece as presented is an edited portion of the original material.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.2.6.

3.2.7 'Mattavāraṇa'—Sulomian Sacred (Track 7)

Figure 34: Mattavāraṇa (sonogram).

Here we have an instance of what I have called my 'spectral subtraction' method (see pp. 81-82). In this method, literally any sound file with a rich frequency component can be used as a source of music. This is achieved by choosing some target frequencies and simply removing every part of the file that does not fall within those parameters. In this instance, as a further development of a successful earlier test (described on pp. 81-82), I took what appeared to be the most unpromising starting point imaginable—a field recording of construction workers building a block of flats in Amsterdam—and applied this method to it. The reader can hear the results for themselves.

The piece is in Vathek A—A A# C# D F F# H H# J A'—and it was achieved in the spectral editing window of the Adobe Audition software to a precision of perhaps ±2 Hz or so. It travels progressively through a series of triads extrapolated from the 12–ET music theory of Richard Bobbitt from the 1950s—a 'neo-Pythagorean' approach that did not persist as an influence.[40] The triads, sometimes repeated through more than one tritave, proceed in the order of consonance applied in Bobbitt's (1959, p . 191) system, thus: A–F–A', A–F–H, A–J–A', A–C#–F, A–C#–H, A–A#–A' and A–H#–A', before returning to the starting point. The various tones fade in and out according to their presence and magnitude in the original source material at a given point.

As I have said elsewhere, while I am sure that I am neither the first nor the last to happen upon this 'spectral subtraction' technique, a comparison of this track with its original source material (Yuval 2013) will eloquently testify to its potential as a source of creative impetus.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.2.7.

[40] For a critique of Bobbitt's theories, which concludes that 'Mr. Bobbitt's "density scale" is based on nothing other than Pythagoras' criteria for consonance and dissonance', see Temperley, N. 1960, 'Re: functional and non-functional dissonance', *Journal of Music Theory*, Vol. 4, No. 2 (November), pp. 233–235, Duke University Press, viewed 2 June 2018. <http://www.jstor.org/stable/843185> (p. 235).

3.2.8 'Makṣikatoupan'—Sūrmian Folk (Track 8)

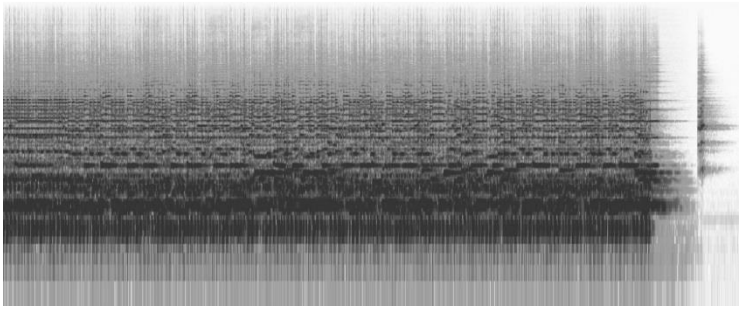

Figure 35: Makṣikatoupan (sonogram).

	0	C	A	F	H	B	C#	A#
0	01-37	38-55	56-65	66-75	76-81	82-94	95-97	98-00
C	01-36	37-59	60-72	73-79	80-81	82-91	92-94	95-00
A	01-25	26-65	66	67-85	86-88	89-94	95	96-00
F	01-21	22-36	37-54	55-70	77-86	87-98	99	00
H	01-14		15-29	30-64	65-78	79-98	99	00
B	01-28	29-42		43-58	59-64	65-90	91-00	
C#	01-16	17-21	22-28		29-30	31-66	67-91	92-00
A#	01-17	18-47	48-57	58-60	61	62-70	71-91	92-00

Figure 36: Makṣikatoupan probability table.

This piece has a somewhat convoluted history. Recorded in mid-December 2019, it was the second-last track created for this project. However, this was a replacement for a previous track that had been completed on broadly similar principles—namely, probabilistic melody generation—in early 2018.

A probability table for 12–ET music derived from work on information theory in music in the 1950s (Pinkerton 1956) was adapted for BP purposes. The first version was unsatisfactory upon relistening to it, and the same table was adapted to create the current version (Figure 42). As the table related one note to another via presumed 'consonance', an opportunity was received in the new version to test the principles regarding a possible BP consonance, as discussed in Section 4.1.3. The figures in Table 10 (p. 115) were applied to a strictly just-intoned version of the Vathek C mode, with the rankings seen in the amended pencil figures written over those that were used on the original table. The notes were chosen to be within a single 12–ET octave to facilitate global retuning.

The generative principle is simple enough; following the selection of a given note, a pair of percentile dice (which give a result from 1-100) are rolled to determine the next note or pause, with '0' on the chart representing a pause. These are read off the table horizontally. This principle was used to construct the melody in the track, although artistic judgement was also used in repeating and varying phrases. The accompaniments were produced by judgement alone. Four tracks are used: three of them come from the Native Instruments Discovery 'Middle East' sample track; the kanun (zither family), which sustains the melody, the daf (large frame drum) and the kemençe (small stringed bow instrument). The latter samples incorporate (more or less accidentally) 'variations' that exist as part of the sample set. These latter samples may not be wholly within the BP scale, but I submit that, in line with my final conclusions, this does not really matter beyond a certain point. Perhaps the samples might be interpretable as early efforts towards BP quartertones—let the ear be the judge.

The final track is a fairly steady 4–4 pulse and is mainly composed of three repeated Vathek notes, mostly emphasising the 'tonic' of C. This is rendered on the Skiddaw Stones sample set to represent

the lithophone. The bowed kemençe is musical onomatopoeia, representing the perpetual buzzing of the bees. The basic figures of each part were derived from different Euclidean algorithms for the best fit of various beats within a 16-count basis; 7 for the kanun, 10 for the daf and 4 for the lithophone. The kemençe roughly followed the two-pattern cycle of melodic figures.

I think it sounds pretty good, considering, and it certainly suggests that the probabilistic approach has equal potential in application to BP as elsewhere. Unfortunately, there was not enough time to experiment with this method in depth, but I may well return to it someday.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.3.1.

3.2.9 'Dārudaśrava'—Sūrmian Courtly (Track 9)

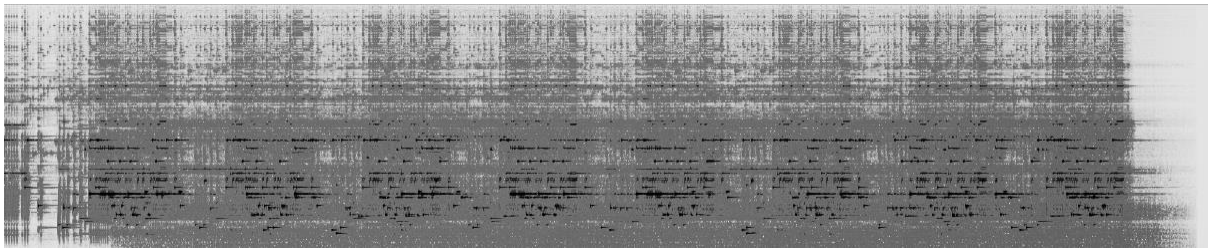

Figure 37: Dārudaśrava (sonogram).

The track presented here is another instance of quasi-algorithmic composition, although in this case the method is indebted to a third-party application, namely the 'MIDIbot' designed by Robby Kilgore (https://robbykilgore.com/midibot-a-midifx-plugin-au-vst/). This small device is, as Kilgore put it, 'a poly-rhythmic pulse generator that probabilistically adds rhythmic and harmonic material as MIDI triggered sequences' (Kilgore 2019, para. 2). I came across it in the course of my various adventures, tried it and liked it well enough to buy and use it. However, Dārudaśrava bears, at best, a very faint resemblance to the original source material, having been drastically modified in the course of its transposition into BP.

Again, this track is in a 'conventional' just-tempered BP in which, however, the reference note—the BP A1—no longer corresponds exactly to the 12–ET E2 of 82.41 Hz. Instead, in this system, where the 'tonic' is a D, the BP A1 is tuned with reference to the BP D1 below it. As this note is at a frequency of 41.92 Hz, the A1 (49/25 in this system) is 82.16 Hz. The following table lists all of the notes used:

	I	II	III	IV	V	VI	VII	VIII	IX	I'
	D	E	G	H	J	A	B	C	C#	D
Tritave	1/1	27/25	7/5	75/49	9/5	49/25	7/3	63/25	25/9	3/1
4	1130.04	1220.44	1582.10	1729.65	2034.10	2214.88	2636.76	C5 2847.71	3139.00	3390.12
3	376.48	406.81	527.35	576.55	678.02	738.29	878.92	C4 949.23	1046.33	1130.04
2	125.56	135.60	175.78	192.18	226.01	246.10	292.97	C3 316.41	348.78	376.68
1	41.92	45.27	58.69	64.16	75.46	82.16	97.81	C2 105.64	116.44	125.56
0	13.97	15.09	19.56	21.38	25.15	27.38	32.60	C1 35.20	38.81	41.92

Table 7: Dārduraśrava retuning frequencies.

The chief merit of this piece for theoretical purposes thus lies in a comparative evaluation of ET versus JI in similar contexts, such as the courtly musics of the north and south islands. It was largely rendered again with the Persian classical instrument samples from the Native Instruments Discovery library, with the usual addition of percussive 'xylophone' and 'marimba' sounds from the Chromaphone 2 synthesiser. The faint 'frog-like' sounds alluded to by Zibethicus above were the result of playing around with the 'Kinetic Metal' library of metallic percussion that arrived in the same update as the Persian instruments.

As the table suggests, the piece is in Vathek D, sans quartertones (being an early work), and does not stray from that territory during its brief rondo-like development.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.3.2.

3.2.10 'Tārakitadravaja'—Sūrmian Courtly (Track 10)

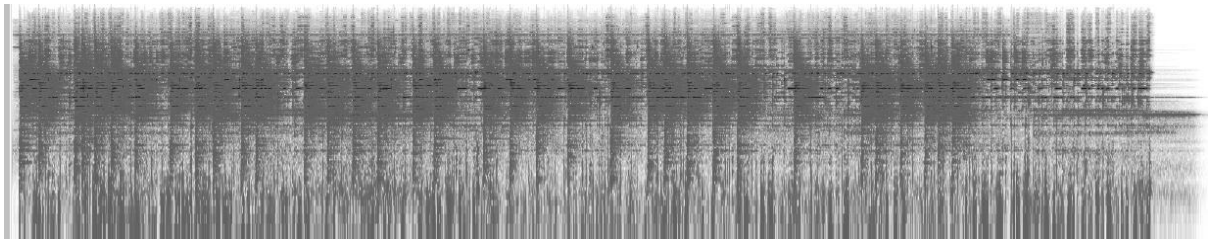

Figure 38: Tārakitadravaja (sonogram).

The piece was originally rendered as a conventional MIDI file in the Fractal Tune Smithy application (http://robertinventor.com/software/tunesmithy/music.htm) and then retuned to a strictly just-tempered Vathek mode in the Logic Pro X application. It is again in the first Vathek mode, but with a 'tonic' of C#—C# D F# G H# J A# B C—although it is notable that one of the notes that occurs occasionally is an H, which does not appear in the mode. This may have been a means of circumventing a quartertone augmentation of the modal G note next to it, which works perfectly well when sounded, but which the court was apparently not willing to countenance at this stage. Most of the instruments are from the Persian classical sample set of the Native Instruments Komplete 12 application, appropriately retuned. The animal sounds are a field recording of a small crocodile in the nocturnal Amazon jungle, considerably slowed down ('felix.blume' 2017).

For further information the reader is directed to the corresponding entry for the track at Appendix A2.3.3.

3.2.ii ‘Antarhāsa’—Sūrmian Sacred (Track ii)

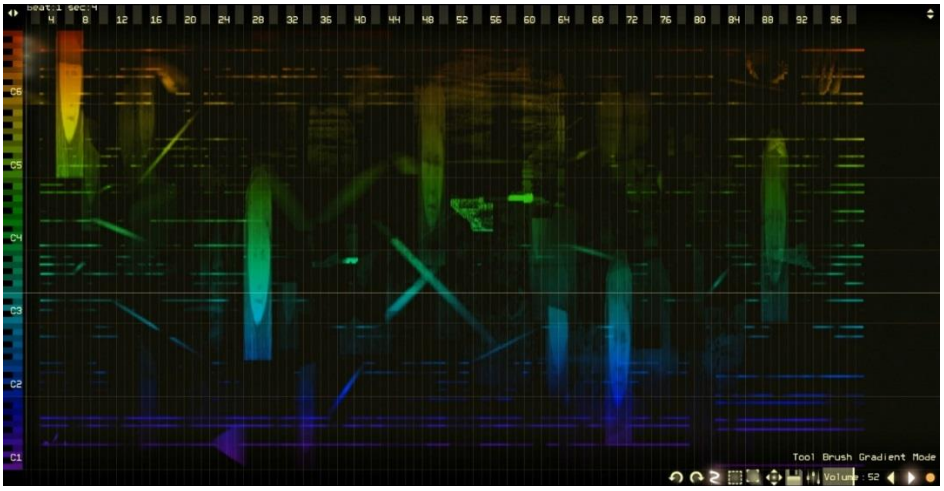

Figure 39: Antarhāsa (Virtual ANS spectral synthesizer).

I am indebted to the ‘Virtual ANS spectral synthesiser’ for this piece. This application is a software simulation of the ANS photoelectric synthesiser created by the Russian engineer Yevgeny Murzin (1914–1970), who, when examining the optical sound method used to encode soundtracks on cinema films, reasoned that it would be possible to reverse the process and use a ‘sound strip’ to create an original sound rather than reproducing sounds recorded elsewhere. The process of creating a practical instrument to achieve this insight took Murzin and his assistants decades of work and eventually resulted in a room-filling instrument centred around a large glass screen coated with a replaceable non-drying and opaque resin. Scratches are drawn in the resin by various means, and a strong light scans the resulting breaks in the resin and translates them into sound. The machine, which still exists today in working form, was used, among other things, to create portions of the soundtrack to Andrei Tarkovsky’s classic science-fiction film *Solyaris* (1972).

The Virtual ANS (https://warmplace.ru/soft/ans/) is a software realisation of the physical instrument, created by Alexander Zolotov. I used it for various preliminary experiments that have not been recorded in this exegesis, and then put it aside to concentrate on other work, particularly because, although otherwise excellent, its unfortunate chaining to the 12–ET scale made it difficult to work with microtonally as distinct from microtonally, presumably unlike the original machine.[41] However, in August 2018 I had occasion to pass by it again, and I remembered that the Virtual ANS would accept photographs as valid data for sonification. I embellished a short abstract BP piece I was working on at the time in just-tempered Vathek A (A–A#–C#–D–F–F#–H–H#–J–A’) with randomly placed and distorted pictures of Madame Blavatsky. The track has been slightly assisted in production with added compression, reverb, etc., but there are no other instruments present than the Virtual ANS itself.

[41] ‘The inventor also planned to use the arrangement that could allow working with an octave divided into 144 intervals, or even 216 .... It is important to mention this, because the inception of spaceflights ... created an image in the minds of the 1960s’ generations that microtonal music was, above all, associated with the infinity of the universe ... and it is no coincidence that the predominant film plots at that time (*Towards the Cosmos*, *Solaris*) and their musical scores were supported by the ANS and non-tempered system’ (Ader 2013, p. 50).

Given the various claims made over the years by various competing parties about possible 'reincarnations' of Blavatsky (including one offered by the more-than-dubious 'Bishop' C. W. Leadbeater to astonished Sydney Theosophists in 1917 as a result of a 'vision' he experienced on the Mosman ferry en route to Circular Quay),[42] I thought that this 'virtual reincarnation' in the direct form of the 'sacred music' of Blavatsky's own imaginary Second Root Race was worthy of a little suppressed laughter, although of course a Theosophist might prefer to classify it as 'mean-spirited and sceptical sniggering', and I will certainly not quarrel with that assessment... The image also reminds me, with apposite irony, of the various forms of 'spirit photography' of the late nineteenth and early twentieth centuries, which usually involved surreptitious double-exposures and created results that were often rather similar. Amusingly, her picture even survives into the regular sonogram, looking quite like a 'spirit photograph':

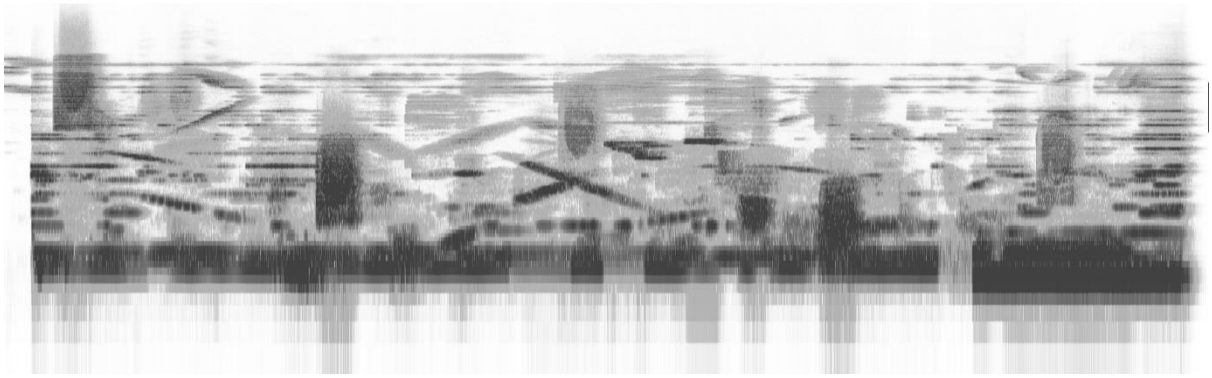

Figure 40: Antarhāsa (sonogram).

For further information the reader is directed to the corresponding entry for the track at Appendix A2.3.4.

3.2.12 'Parṇavādya'—Sūrmian Sacred (Track 12)

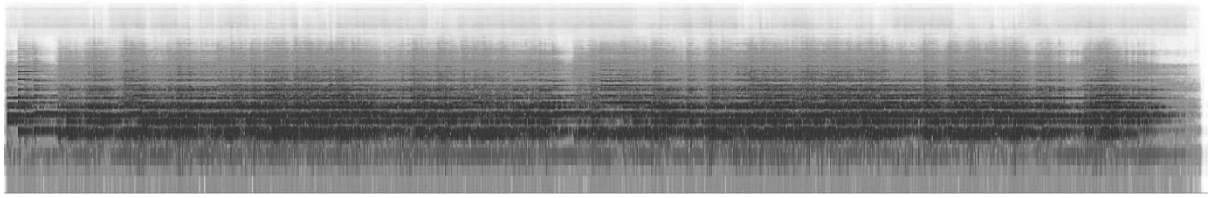

Figure 41: Parṇavādya (sonogram).

Here, I attempted to test the prospect of supplementing or replacing the electronic air-production methods of previous Pujol prototypes with a small electric leaf-blower (whence the working title). This was found to reduce both electrical interference in the various pickups and the degree of controllability and expressiveness achievable in other Pujols. The piece was in Vathek E (E–F–H–H#–A–A#–C–C#–D–E'), in standard equally tempered tuning (as this piece was produced in August 2019, by which time I had concluded that there was little if any effective difference between the two forms, at least in my practice at the time).

[42] 'Citydesert', 'Madame Blavatsky on Sydney Harbour', *C. W. Leadbeater 1854–1934*, weblog, viewed 18 October 2019, <https://cwleadbeater.wordpress.com/2016/05/10/madame-blavatsky-on-sydney-harbour/>.

The instruments used were the Protong, tuned to E–C–C–A; the Kumbhira, tuned to C#–C#–C#A–H–C (these tuning choices were largely made on the basis of safest practical string tensions, as I was short of replacement strings at the time); and the three-row Pujol harp. Each Pujol harp was tuned in unison to form the triad E–C#–E'. It is worth noting the dual function of this triad in BP harmonic theory; not only do Mathews and Pierce list it (as the 0–11–13 triad) as the most consonant BP triad as perceived by formally trained musicians (Mathews & Pierce 1991, p. 171), but Hajdu also noted that the BP eleventh is 'perceived, by many a listener in the isolated context of the experiment, as the familiar … major tenth' (Müller, Orlandatu & Hajdu 2014, p. 142). Hajdu also noted that the 0–11 interval is classified, together with the 0–6 interval, as the most consonant interval after the tritave. This reinforces the suggestion of its possible utility as a 'consonance' in a triadic BP theory, and this track may be regarded as a statement and exploration of this relationship. (This also speaks to my suggestion of the possible utility of the interval as a 'replacement fifth', as discussed at greater length in Section 4.1.3.) Tracks were repeated in shuffled and staggered order to fill out the sound in the final version.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.3.5.

3.2.13 'Nakṣatravinoda'—Praśāsitran Popular (Track 13)

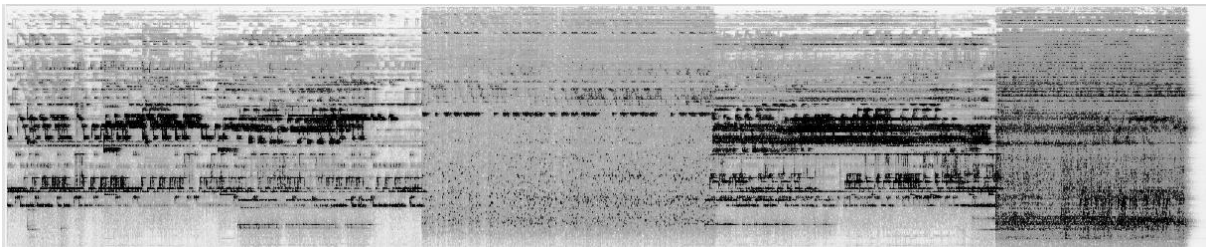

Figure 42: Nakṣatravinoda (sonogram).

Despite the seeming simplicity of its origins, this track was actually one of the more laborious to produce. The essence of it is a quotation from a public domain MIDI file of the song 'Ah! vous dirai-je, maman', which, as has been noted, has furnished generative material in two other tracks ('Krāntipātagati' and 'Tārakitadravaja'). However, in this instance, the intention was different, as was the realisation.

The first and third sections are nominally in a somewhat conventional equally tempered Vathek F# (F#–G–J–A–B–C–D–E–F–F#'), but to preserve something of the original tonal relations of the 12–ET song, the non-scale notes A#, C# and H have been added. Additionally, two 'quartertones' were required, which in these two cases were arrived at by logarithmic methods. The first—what one might call 'D#' in the BP sense, that scale usually not having such a note—was arrived at by multiplying the base frequency of the tritave by $3^{2.5/13}$ to arrive at a rounded figure of 1.235. (In the equally tempered chromatic BP scale with a 'tonic' of C, the second note of the scale, D, is arrived at by multiplying the frequency of the tonic by $3^{2/13}$ or 1.184. E, the third note, is given by $3^{3/13}$ or 1.289.) An additional 'G#' is arrived at by similar means, with the multiplier given by $3^{6.5/13}$.

The original source MIDI file is scattered somewhat promiscuously about these parts in various fragments that have also been manipulated in various 'creative' ways, such as reversal, protraction

and multiplication. Despite this, the piece appears to retain a certain sonic coherence in these sections. However, the two that interrupt them are a different story to some extent. As a means of signifying and sonifying the rebellion of the Bhīmasaraṭans, each of these pieces was given an entirely different tuning that was chosen, within certain parameters, by a random dice roll. This was to ensure that they bore no particular frequency resemblance to the original tunings; at least, no straightforward resemblance. The tuning of the first intrusion has a C2 of 90.57 Hz where the standard C2 is 106.20. The second section has a C2 of 150.15 Hz. These were also chosen to liberate the tuning system from any set relationship to standard 12–ET tuning (as well as the standard BP tunings) to provide a means of exploration of BP in areas completely outside of existing accepted relationships. The individual listener will have to decide on the merits of the outcome for themselves.

The quartertones in these sections were achieved using different methods, namely averaging the multipliers of the notes they fell between. Thus, for example, a BP 'D#' interpolated between the D (1.190) and E (1.286) of the first retuning was given a value of 1.238. While this does not differ significantly from the earlier, logarithmically derived result for the same note of 1.235, it is at least of academic interest as an exercise. Again, the reader will have to judge for themselves whether the difference is significant or even perceptible; frankly I doubt it, although perhaps a person with perfect pitch would perceive the difference.

This track also differs from the usual practice of 'folk' or 'popular' music in this project. Despite the 30+ individual renderings that were necessary to express every one of the four different sections in each of the three different tunings used, in each case, through individual retunings of each successive 12–ET octave through the range of the track, only one instrument is used for all of the sounds that are heard: the Arturia Synclavier V. This instrument—a virtual realisation of the original Synclavier instrument developed by Jon Appleton and others in the 1970s and produced commercially in various forms by the New England Digital Corporation from the 1970s to the 1990s—was used here for several reasons. First, the sounds achieved by the Prāśasitṛians all tended towards greater mentally synthesised and abstracted forms (with a few exceptions), and the Synclavier is a very good means of expressing this. Second, the approach was a direct tribute to Jon Appleton's early use of just this instrument for BP music (see footnote 12). Third, it was also an indirect tribute to Frank Zappa's use of the instrument exclusively on all tracks but one of the last album released in his lifetime, *Jazz from Hell* (1986).

I wish I had had more time to work with this instrument, but this was one of the last pieces I composed, in September 2019, and the method of retuning and rendering by successive octave is an extremely slow and laborious way of proceeding, even if the results are somewhat more reliable than other methods attempted.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.4.1.

3.2.14 'Vyālamṛganṛtya'—Praśāsitran Popular (Track 14)

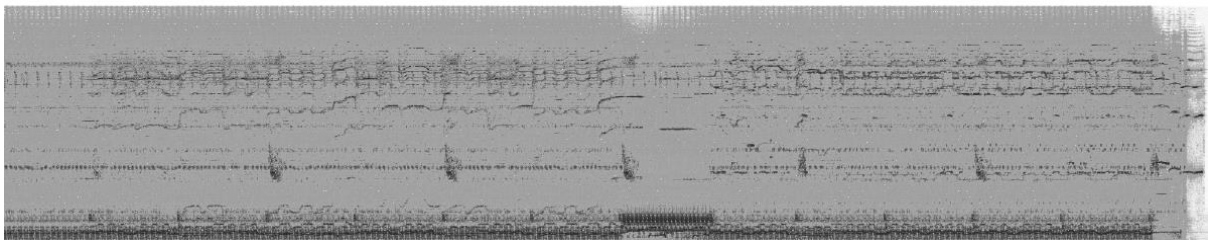

Figure 43: Vyālamrganrtya (sonogram).

This track represents a (successful) experiment in applying BP to a 'rock' and a Laramidian idiom simultaneously. It is in Vathek B (B C E F G H J A A# B') and is in the standard rock format of drum machine–bass–guitar–keyboards. It is in a standard rock beat in a fast 4/4 time, and it is organised around a bassline of Ramonesish simplicity that, in the verse, repeats G1–H1 three times in three bars and expresses an F1 for the fourth, all on the lowest string. After two repetitions of the verse–chorus pattern, all instruments drop out except the bass (which plays a 'bridge' figure here) and a fast 6/8 hemiola on the toms of the drum machine, representing the tyrannosaurid's rush from cover. The pattern then repeats again with an added brass solo.

The bass is tuned D1 F#1 J1 B1, as being the closest in string tension to standard bass tuning, and is played on a Cort B4F fretless bass with the 'frets' marked with tape. On the third repetition, the bass figure for the verse is duplicated in the next string up, which results in an expression of J1–A1 and then H1. The 'chorus' has J1–A#1 within a bar and then B1 for a bar; this repeats thrice and is concluded by a chromatic descent back down the string C1–B1–A#1–A1. It is thought that this system, which in the verse portions might be interpreted as idiomatically imitating the characteristic 'raising by a fourth' of some rock bass lines, is a major contributor to the 'rock' feel of the piece. The bass was rendered in the 'virtual' Ampeg products of the Plugin Alliance group.

The guitar (the Protong) is played as a drone with an eBow and a brass slide and is tuned A1 C2 D2 H2 A2 C3 using the same principles as the bass. The eBow line remains in the A2 string, alternating between E3 and F3 in the verse, rising with the 'fourth' to G3–H3 and sustaining a J3 in the chorus. It was rendered through the Native Instruments Guitar Rig 5 application and uses, among other effects, a ring modulator and a signal splitter. The channels are swapped when it drops out in the hemiola.

A choppy, percussive sequence played on the Native Instruments FM7 (which incorporates a software emulation of the Yamaha DX–7) repeats a constant A#2. After dropping out during the hemiola, it reappears but now also plays a non-scale 12–ET E4 (due to an error in my reckoning) and a BP C#3. The non-scale note does not appear to be catastrophic to the overall project, and if I was more cynical I would pass it off as a 'BP quartertone' or something of the sort. I have not bothered to fix it because my ears do not persuade me that I need to—and at 16 cents below the arithmetical mean of the interval between the BP notes (the 12–ET E4 is 329.63 Hz and the mean of the BP intervals between C3 and C#3 is 332.64 Hz), the note is possibly a fair candidate for such interpretation in any case. This is an interesting instance of plasticity of perception.

A final insult to the refined sensibilities of the mainstream Prāśasitṛians is offered by a brass instrument solo that picks up after the hemiola, as mentioned by Zibethicus above. This was created using the AKAI EWI USB wind synthesiser, following the purchase of a third-party software package with funds from the Thesis Completion Equity Grant. This 'Instant EWI' application permits the EWI to input data directly into the Mac-based Logic Pro X digital audio workstation, where otherwise tedious and elaborate workarounds are necessary. The solo was entirely improvised by ear and then transposed into BP notes using the usual method of global retuning within a 12–ET octave, which was also used to retune the FM7 sequence. The initial application used to express the MIDI notes was the Alto Sax 2 sample set in the built-in 'Studio Horns' package in Logic Pro, although this was heavily processed. On finding that the end result conflicted timbrally with the guitar, the solo was stepped down a tritave by first tuning it down a 12–ET octave and then a 12–ET fifth. This seemed to work better in practice, and in this context one is not bound to sonic realism.

The dinosaur roars come from a toy used by my seven-year-old son. They are processed, but not unduly so.

As a whole, the track was then produced in a 'rock' idiom using Plugin Alliance and Planet Waves Abbey Road and Izotope Ozone tools of various sorts. The final result is one of my favourite tracks in this project.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.4.2.

3.2.15 'Vṛkatātviśvavidyālaya'—Praśāsitran Courtly (Track 15)

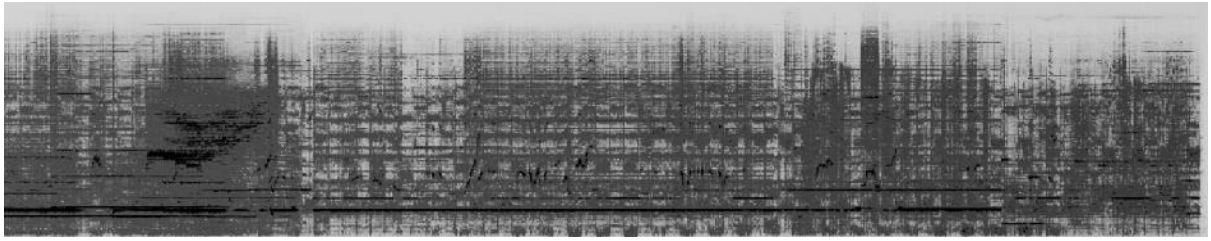

Figure 44: Vṛkatātviśvavidyālaya (sonogram).

The origin of this work can be traced to frustration at what Sir Thomas Urquhart (1611–1660) memorably anathematised in his *Ekskybalauron* of 1652 as 'quomodocunquizing'. In short, this was one of the many stages of 'progress' in this project at which I became exasperated enough to threaten to quit; but I had already come such a long, weary way that I was resolved to make a final artistic statement on my way out the door, as I perceived things at that time.

I resolved to make a 'symphony of screech' in much the same idiom (and quite possibly for the same sorts of reasons) as the late Lou Reed (1942–2013) did in his immortal double album *Metal Machine Music* (1975). This entirely instrumental and guitar-based artwork—presumably influenced by Reed's exposure to the 'drone' musics of La Monte Young in the early 1960s (his bandmate in the Velvet Underground, the conservatory-trained John Cale, was also a member of Young's

ensemble)—was almost universally repudiated on its initial release.[43] (Even today, the popular review site AllMusic gives the work one star out of five and describes it as 'both brutal and numbing' (Deming, n.d.).) For the rest of his days, Reed alternated between dismissing '*M/M/M*' as a stupid and deliberate joke (each of the four sides of the original vinyl release are exactly 16:01 in length, and Side Four ends in a locked and endless groove) and defending it as the greatest and defining work of his career.[44] Its influence on subsequent 'industrial' and 'noise rock' acts has been considerable. However, where Reed pursued a particular method (and claimed that there were multiple allusions to classical music buried in the walls of guitar feedback—a possibility supported by the work's transcription for and live performance by the classical ensemble Zeitkratzer in 2002), I wanted my 'final' statement to have a more direct relationship to Western art music. Thus, I planned an ordered piece that, however, did not materialise as I had expected.

First, I calculated the average length of each of the movements in Haydn's symphonies. Despite the inevitable variation between different performances and recordings (I used the Philharmonia Hungarica's complete bicentennial edition from the 1960s), I thought that this would give me an appreciable if arbitrary point to plan 'structures' within. After several days of converting minutes to seconds for averaging purposes, I became inexpressibly disgusted with the whole process and decided that I had made my point well enough. I therefore stopped at the 48th, with average running times of 5:29, 5:42, 4:02 and 3:33 for each of the four movements (I omitted the three-movement works from the analysis). This added up to a total running time of 21:15, which I thought was a reasonable amount of time to expend on a procacious 'farewell' salute.

I then planned the specifics of my intended effrontery. The piece was to proceed through its four movements in a manner based on triadic harmony as expressed by the Pujol harps, but they were to be driven by excitation from feedback from amplifiers rather than the customised electronics driving the fans. As befitted the modester scope of what I decided to call a 'Sinfonietta', the work throughout was to be in one key: equally tempered Vathek J (J–A–C–C#–E–F–G–H–H#). The original title of the work—I had rejected the Laramidian idiom at this stage—was *Sinfonietta o—(Revenue and Expenses)*. The overall plan of the work came from a financial summary statement received from a major Australian institution. In a series of quarterly summary reports for the calendar year 2013, total revenue consistently outstripped total expenditure to result in a gratifying profit being recorded for each quarter. The Pujol was tuned to have a highly 'dissonant' triadic expression, as determined once again with reference to Pierce and Mathews' (1991) characterisations of these

Figure 45: Vṛkatātviśvavidyālaya recording method.

[43] 'Hopelessly old-fashioned … The tubular groaning of a galactic refrigerator … Cosmic scrapings … Deliberately, intensely boring … Distended buzzing … Stroboscopic sludge …' (Wolcott 1975).

[44] 'In 2007, Reed told Pitchfork, "The myth is sort of better than the truth. The myth is that I made it to get out of a recording contract. OK, but the truth is that I wouldn't do that, because I wouldn't want you to buy a record that I didn't really like, that I was just trying to do a legal thing with. I wouldn't do something like that. The truth is that I really, really, really loved it"' (Richardson 2017).

properties. Thus, the Pujol, which symbolised Expenses, had parts of its array of strings damped to make the appropriate transition in tuning from one movement to the next at a point to be selected in improvisation while the 'movement' was actually still in progress. The damper—usually a guitar plectrum pushed through the strings—was changed from one half of a harp's six strings, tuned to the second note, to the first three strings, which were tuned to the original note. (As total expenses increased in each quarter, the strings were tuned higher to represent the 'undesirable' accumulation of costs.) The progression of the four movements, each to be edited from separate improvisations, was G–E–J—E–C–J—H–F–J—J'–E–J.

Against this was arrayed a series of other instruments: the Zigura, the Protong, the Kumbhira and a conventional guitar (the frets were irrelevant here, as open strings retuned to BP were all that were being used). These instruments symbolised the harmonic glory of Revenue and were thus intended to be comparatively 'consonant'. The ten strings of the Zigura—the electric lyre—were tuned into notes from a given triad for each movement. Efforts to damp certain of these strings to achieve a transition effect similar to that used on the Pujol harps proved ineffective and were abandoned. The Zigura went from G–C–J—H–C#–J—H–E–J—J'–H–J. The other instruments were tuned somewhat opportunistically in whatever scale notes their ancient strings seemed likely to be able to bear.

Reed was reticent about the means by which he achieved his effects on *M/M/M*, which was fine with me because I did not want to create a mere tribute in any case. A further key influence on this track, or at least its intended trajectory, was the classic recording 'Pulp' by the New Blockaders and Organum, British noise and 'anti-art' sound artists. This legendary 7" wall of noise was originally released in 1984, and it cannot have been long afterwards that I heard it on the Sydney community radio station 2MBS–FM, to long-lasting and indelible effect (although it took me years in those pre-internet days to find out what it was called and who it was by).[45] Again, details of the method are non-existent, because the artists involved refuse almost all interviews, but between the various influences of *M/M/M*, 'Pulp' and Xenakis' *Persépolis*, I was finally able to arrive at a provisional recording layout (see Figure 45).[46]

Here, the Pujol harps can be seen at the centre left, in front of a 25W Fender Frontman amplifier with the strings and pickups facing it. The 100W Peavey ValveKing amplifier at the top right embraces the Protong to its left and the conventional Schecter Diamond Elite guitar to its right, again with their pickups facing inwards in practice. The Kumbhira is at the bottom right, running into a 100W Crate amplifier. The Zigura was also used in practice, running into the Crate. A matched pair of Røde NT5 microphones is visible in the centre, placed in a would-be 'binaural' configuration. (I used the cheapest amplifiers in my inventory for fear of damage from the intended levels of feedback. I was willing to risk the mid-level Rødes in pursuit of fidelity of reproduction.)

[45] "'Pulp is the King of all Noise 7"s. All other Noise 7"s want to be Pulp.' Ron Lessard (RRRecords)", cited in Bianchi & Guglielmetti, 2005–2019.

[46] Despite the reclusions, Organum is known to be the name used by the British sound artist David Jackman, a former member of Cornelius Cardew's Scratch Orchestra.

Thus, this was the configuration by which I hoped to achieve my effects. My original intention has been described, but it was frustrated by circumstances. I could not avoid starting the recording in my unsoundproofed studio at a time when my children were at home, and their complaints about the nature and volume of the sounds coming out of 'Dad's room' were so vociferous that I reluctantly turned down both the amplifiers and the outputs on the guitars and other instruments, which were being used without effect pedals.

I was startled to discover that the feedback stimulus did not cease altogether under such conditions, and with a bit of care and judgement could actually be made to do some worthwhile things. I kept recording, and this track is the result. It is very much precisely as the Rødes perceived it, barring some standard production work, the editing-out of the necessary pauses for retuning, and some sparse overdubs of a solo Protong played with an EBow and a brass slide. Variations in the sounds generated by feedback were achieved by moving the amplifiers and instruments and adjusting their gain and output settings. This process was entirely improvised, but with an effort made to stay approximately with the times set for each movement, as measured by a stopwatch. Miscellaneous sounds from shortwave radio—a burbling pulse and unintelligible voices partly smothered in interference—were also added as a substrate and overdubs, for no better (or worse) reason than that I have always liked them.

I find the end result—admittedly achieved by happy accident—to be highly satisfying, so much so that I have named the method used 'symphrovisation' and I hope to expand further on it in the future. (It is interesting to note that, despite the original intention of a tension between 'consonance' and 'dissonance', every casual listener thus far exposed to the track has evaluated it as 'consonant' and even generally agreeable—something few people are willing to say about *M/M/M* or 'Pulp'.) The method is of course independent of specific tunings, but one of the things that I like about it is that it appears to potentially offer a viable compromise between the insistence on form and replicability of Western art music and the 'structured improvisation' of other classical musics such as Persian and Indian. Given enough instruments, personnel and money, it would be possible to create repeated performances of an event of this nature that were partially planned and partially improvised. One could never be entirely certain of what one would be about to hear beyond certain parameters such as 'key' and approximate duration, although a form could also be imposed if desired. Perhaps the principles of Byzantine chant might be an interesting place to begin investigations…

For further information the reader is directed to the corresponding entry for the track at Appendix A2.4.3.

3.2.16 'Tatpara'—Praśāsitran Sacred (Track 16)

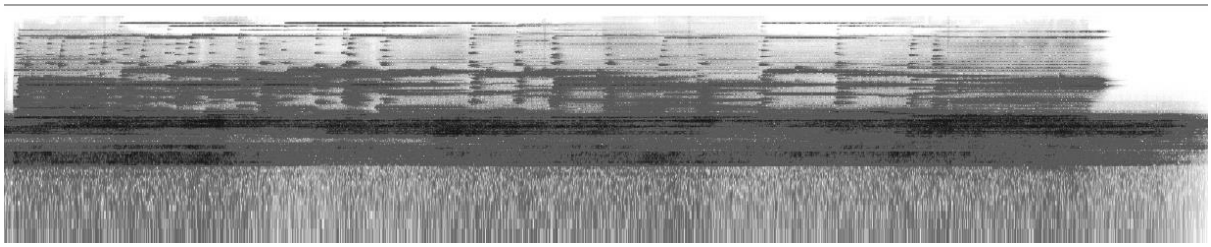

Figure 46: Tatpara (sonogram).

The droning sound heard throughout the piece is that of the planet Jupiter (sourced from public domain recordings created by NASA – 'adamcooperteran' 2013). The Laramidians could detect this audio source, admittedly with great mental effort, and by this stage they could also amplify and re-emit it, with the frequencies filtered to coincide with the BP notes employed in their music, as in this case. Thus, they seem to have been literally capable of playing 'the music of the spheres' in at least this sense.

The sonic organisation of this piece is remarkable in its own right. The reference tone has changed, and for the first time in the surviving examples, it corresponds to that suggested by the TranSpectra Ensemble; in 'Op de Coul' terms, an A4 of 440Hz (in our previously most common tuning, based on Bohlen's suggested A1 of 82.41 Hz to equal the 12–ET E2, the closest BP note to this figure is F3 at 446.76 Hz). Finally, if one truncates the extremely elongated notes of the Laramidians' mentally produced 'melody' (rendered here by the Arturia Synclavier V and Fairlight CMI V), one again finds a near-replication of the eighteenth-century French song 'Ah! vous dirai-je, maman', or perhaps its actual origin, as musicologists attribute it prior to its 1761 publication to an unknown 'pastoral' source (List 1978). Remarkably, as recorded in the sonogram and reproduced in this reconstruction as accurately as possible, the BP notes in this piece—unlike the other two earlier Laramidian treatments of the same melodic fragment—are pitched to the nearest frequency equivalent of the 12–ET notes. The fact that all casual listeners of this piece have accepted it as 'tonal' is remarkable, in that the notes have all been considerably retuned from the 12–ET frequencies as they are accurately retuned to the particular expression of BP described. The average difference in value between the 12 BP notes used and their nearest 12–ET equivalents is 39 cents, more than one-third of a semitone, and probably perceptible to even a naïve listener. This cannot be parsed as '12–ET' music—and yet the frequency relations also have no formal functions in any BP system bearing parallels to common-practice harmony. For the moment, the cognitive processes underlying the apprehension of this piece must remain a profound mystery—like so much of what we can only conjecture about Laramidian society in general—but it might be interesting to run an fMRI scan on volunteers exposed to a less 'artistic' version of this tune to obtain snapshots of what was being processed, as well as how and where it was being processed.

For further information the reader is directed to the corresponding entry for the track at Appendix A2.4.4.

3.2.17 'Kṛtrimakeśāvartī'—Praśāsitran Decadent (Track 17)

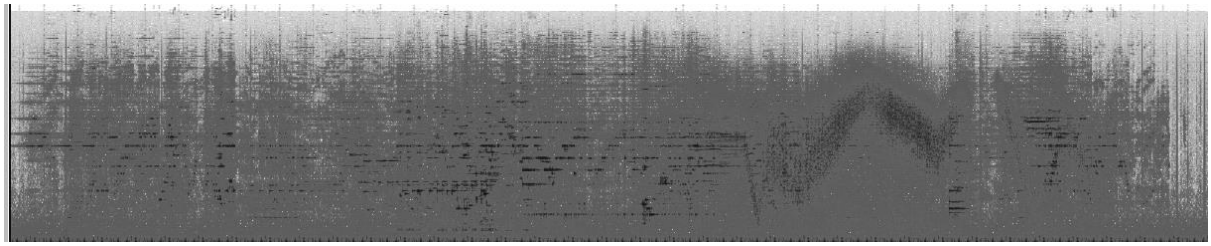

Figure 47: Kṛtrimakeśāvartī (sonogram).

This track is an amalgam of two tracks in BP: 'Krāntipātagati', as mentioned by Zibethicus in the corresponding entry in Appendix A (he is at least credible on *this* point!) and a previous and rejected version of 'Makṣikatoupan', which does not appear here. These were overdubbed by ear with 12–ET

additions by the Very Irreverend Arlo P. Thumpkin, demon organist and host of the 'Golden Nutsack of Faith' outreach-and-grab program of the Church of the SubGenius.[47] These are also combined with portions of a non-BP track of Thumpkin's own creation. These overdubbed versions were collaged together by myself at whim.

Their presentation created difficulties; overdubbed in America, the tracks were only available as .mp3 files, whereas the final 'deliverables' were intended to be presented as high-quality .wav files. This challenge was met by 'creatively' succumbing to the circumstances. As the master recording was irretrievably *relatively* 'lo-fi', having necessarily been created from .mp3 files, the Waves Abbey Road Vinyl plugin was used to make the track still *more* lo-fi in a creative direction. Simulated surface noise, wow, flutter and heavy crackling were used to give the finished track the impression of being what Zibethicus described it as being above: a low-quality and worn acetate disc from the 1960s. (The presence of obviously digital synthesis in the recording is simply one of those mysteries we must learn to patiently accept.) This presentation, in turn, led to the creation and invocation of Lovelorn to account for its retroactive 'existence'.

In fact, this material has been presented here because of its innate interest and relevancy to this project. Upon hearing some of the tracks, Irrev Thumpkin decided he wanted to attempt to overdub them, and I was happy to let him undertake the experiment. I find the results intriguing, and my judgement is that they 'work' perfectly well. To the best of my knowledge, this is the first time that the two systems have been employed simultaneously in this manner (although they have been employed serially in various works by other artists), and I find the apparent success of the attempt to be strong supporting evidence of the idea that, as Bohlen suggested, his scale exists in 'a far-reaching duality to the traditional Western scale' (Bohlen 2010, p. 15). The details of working this out I gladly leave to others; I will limit myself to presenting these fragments as proof that this duality goes so far as to permit the two systems to co-exist, at least outside the fictional universe of Laramidia, in which such attempts proved so thoroughly fatal. But a calamitous divorce is always more media-worthy than a quietly happy marriage...

For further information the reader is directed to the corresponding entry for the track at Appendix A2.4.5.

[47] 'Irreverend Thumpkin' is a real person and a skilled musician who lives in America. He specifically requested to be credited in this manner. It is a SubGenius tradition to take on new and sometimes 'facetious' names when joining the Church.

Part 4: Bureaucracy (The Paperwork)

> The best education consists in immunizing people against systematic attempts at education.
>
> Feyerabend, *Farewell to Reason*

> The musical scale is not one, not 'natural', not even founded necessarily on the laws of the constitution of musical sound so beautifully worked out by Helmholtz, but very diverse, very artificial, and very capricious.
>
> Alexander J. Ellis, 'On the Musical Scales of Various Nations'

> If we knew what we were doing it wouldn't be called research.
>
> Avery Broderick

4.1 ASSESSMENT

4.1.1 'Success' or 'Failure'—or Both?

What does it mean to 'succeed' or to 'fail' in a Doctor of Creative Arts program? The UTS rules state that the creative work or works 'must reflect research as well as creative practice, fitting into a tradition of research in an area, demonstrating a clear understanding of the current state of knowledge in that area, have a clear research question and generate data that addresses that question' (UTS 2018, para. 4). The dissertation must '[provide] a clear synthesis and statement of the new knowledge produced by the creative project' (para. 14).

In that sense, then, it falls to us to make some sort of assessment on the basis of the research question. This changed in the course of the doctorate and might well have changed again had there been time for the formal process required, but it has been stated as follows: 'Are there ways in which creative explorations of the Bohlen–Pierce scale can offer an effective context and/or impetus for the creation of new musical works?'

As shown in Part 3, there has been much data generated to address this question. Much of the detail has been summarised previously. Research prior to this doctorate expressed the 45 'basic' modes of the BP scale for what was thought to be the first time. The early stages of the doctorate built on this research and examined the governing assumptions of Bohen, Prooijen and Pierce and his associates, including Mathews and Roberts. It projected these against a background of more formal theoretical considerations of the implications of the scale, including Dave Benson's suspicion that the foreignness of the scale doomed it to obscurity in a world increasingly swamped with 12–ET, and Sethares' view that the tonal structure of BP required and/or implied a new music theory.

I never undertook to attempt such a theory, and I gravely doubt that I would be competent to do so even if I wanted to. I am merely following in the wake of talented people—and yet I will venture to suggest that my labours have not been entirely without value. For instance, in my articulation of the 'Vathek family' of modes, I have stepped outside the 'standard' structure of most BP music, which has built on the assumptions and articulations used by Bohlen and Pierce et al. If I had not been exposed to the seven-note expression of the scale suggested by van Prooijen, with its two three-step gaps, it might never have occurred to me to try expressing the Bohlen-style nine-note scale with a single augmented three-step tone of my own—the definition of the Vathek mode. Then again, given the amount of 'Mediterranean' music I was absorbing at the time, perhaps something of the sort would eventually have occurred to me. Who can say?

But the practical exploration of all that has been undertaken in the course of this program amounts to little more than a scratching of the surface. There are thousands of ways to express a BP scale like this with a single augmented step in various positions. I have explored one of them, and the Vathek modes are only one of universes of possible approaches. Van Prooijen's system was only touched on at best, and it surely merits further attention. In particular, this and Bohlen's original expression attempted to preserve a category of triadic-based music that transferred the (assumed) affective properties of 'happy' and 'sad' from Western art music to BP. Here, I address questions of 'new knowledge' by suggesting that, in leaving this part of the map aside—jumping feet-first into a system less triadic than 'melodic'—I have opened up at least a tiny line of promising enquiry into a vast blackness of unknown territory. Classical Persian and Indian musics manage to exist with little or no reference to the harmonic concepts of Western art music, and until comparatively recently, many people's musics existed without formal written notation or, for that matter, without the conception of an exalted 'composer' who was perpetually above 'mere' performers. [48] I therefore formally express my first research conclusion:

Attention to non-Western musical idioms can provide useful material for practical BP expressions.

4.1.2 Towards the 'Ouch Factor'

In a thought-provoking and reasonably recent article, the ethnomusicologist Professor Emeritus Bruno Nettl (1930–) summed up his view of the developments in his field over his long career (Nettl 2010). He noted a progression of phases of interest in the 'origins of music'. Discussing these, he observed that 'all of these theories assume that some kind of human culture already existed before music could come about .... Music is not seen as fundamental to human culture, but as something brought about to enhance culture' (pp. 176–177). Contrastingly, he pointed out that 'the Havasupai of Arizona believe that spirits that existed before the coming of humans communicated with each other by singing' (p. 177).

[48] Turkish makam music had no written notation whatsoever until after the fifteenth or sixteenth century (Ergur & Doğrusöz 2015, p. 151), and even in Bavaria, monasteries were still singing from neume notation as late as the fifteenth century (Szendri 1986, p. 316). So-called 'African music' is a cultural and scholarly minefield, but a recent study conceded that 'Africans transmitted most of their musics orally, without indigenous forms of written representation' (Shelemay 2009, p. 24). Javanese music was un-notated until European influence in the nineteenth century (Becker 1980, p. 11), and the Pitjantjatjara or Arangu people of Central Australia have managed to achieve 'an amazing perfection of intonation' in their singing without the use of any notation (or reference instruments) (Will & Ellis 1996, p. 211).

Indirectly, this raises an interesting question: If it is conceded that the BP scale is a valid system of making music, why is it that no society appears to have discovered it before our own?

The calculations involved do not appear to be too intimidating. The framing interval of the thirteenth is available to any instrument with a two-octave range. The near-ubiquity of fretless instruments of the violin form and open-stringed instruments such as lyres seem to imply that an open-eared experimenter could and should have stumbled on these intervals and tested other stops on the string or other strings until some of the intervals emerged. The scale is not impossible to sing, and perhaps no more difficult to sing well in than the 12–ET scale.

It may have been a question of inertia. Assuming that the octave interval is the first to be arrived at, and the fifth possibly the second, why search beyond that frame? Perhaps the claim of Bell and Jedrzejczak (2017) that there is a 'natural' detector of the 12–ET semitone in the human inner ear can help explain this. But then the speculation that male and female voices 'naturally' express octave intervals in singing is questionable; one study of the spoken voice, at least, placed the mean fundamental frequency of voices at 'around 120 Hz for men and 200 Hz for women' (Pépiot 2016, p. 1). This is not a tritave, but it is not exactly an octave either! Given all of the imponderables associated with the act of singing, it seems reasonable to suggest that—as we have seen with Central African musicians, at least (see p. 32)—the 'octave' relationship may be as much a matter of cultural accommodation as a 'natural' process. It seems to me that evolutionary musicology must address the fact that, whether or not there is no evidence for a brain mechanism that is sensitive to small-integer ratios in hearing, as Parncutt and Hair claimed, it seems unlikely that these ratios would occur frequently in the soundscapes presented in the environments of early hominids (except of course as harmonics).

Partch, the Great Ratiocinator, fumed that the musical system of his day was limited to ratios with prime numbers as high as multiples of five: the 'five-limit scale'. His own system was an 11-limit scale, and he recognised ratios of 13 as viable but did not employ them because of 'purely personal and arbitrary' reasons, amounting to the idea that he had already done enough and stuck his neck out far enough (see Partch [1974] 1979, p. 123). In David Doty's *The Just Intonation Primer* (Doty 2002), a useful document both in itself and as a corrective for some of Partch's notions, Doty remarked that 'some composers and theorists (Harry Partch and La Monte Young, for example) hold the view that our comprehension and appreciation of musical intervals is gradually evolving up the harmonic series' (p. 61) towards the acceptance of intervals with integers in the 11 and 13 range. Doty was doubtful about this, offering his view that 'if intervals of 11 and 13 have a role to play in Western, harmonic music (as distinct from modal, melodic and heterophonic music, where they definitely have a historical role) I am inclined to think that it will be a subordinate one' (p. 61). But in this sense, Partch noted the presence of '7, 9 and 11 … as components of current scales in ancient Greek music' (Partch [1974] 1979, p. 120), and he further attributed ratios of 13 to this music on the (questioned) authority of Kathleen Schlesinger (1862–1953) (Partch [1974] 1979, p. 396).

This in turn raises another question: Why, if these ratios are implicit in music of this time, is it necessary to 'evolve' the ability to perceive them in contemporary music all over again? Of course, Parncutt and Hair dismissed all of this as residual Pythagoreanism in the first place, and while they may be wrong, it seems difficult to know for certain, given the amount of seemingly contradictory material I covered briefly in Section 2.1. If we are to suggest an actual evolution in the literal biological

sense towards sensitivity to these ratios, it was generally thought that the roughly two millennia between Pythagoras and ourselves was too short a time for any putative change in the physical structure of the human ear or brain to occur, but recent thinking seems to suggest that this might be at least possible, and perhaps possible within a single lifetime (Pennisi 2016). It would be fascinating, if perhaps ultimately futile, to know more about this; perhaps with recorded material now stretching back over a century, a statistical examination could be designed to assess this prospect.

It has been argued that 'the ear' should be the arbiter of judgement, but many people have laid claims of privilege over the ear to advance their theories, notably many of the composers and theorists already covered in this document. Going back to Aristoxenos, for example, we find that he defined musical pitch as 'a certain persistence, as it were, or stationary position of the voice' (Aristoxenos 1905, p. 173), and that 'for the voice to be stationary means its remaining at one pitch' (p. 174). This sounds reasonable enough—until we recall the Free Music Machines of Percy Grainger; in the scores that Grainger wrote for his machines, the oscillators 'may hover about any "note" without ever alighting upon it' (Linz 2003 para. 4). But I have not yet seen anyone willing to claim that Grainger's Free Music pieces are 'not music' because of this property. And of course the ANS synthesiser, the Ondes Martenot and even the theremin do, or at least can do, the same thing. One wonders what Aristoxenos might have said, to say nothing of Pythagoras …

I wish I could lead the reader out of these thickets of bewilderment and into a single bright, clear certainty, complete with simple formulæ like those of Fadades, which would resolve everything in a satisfactory and probabilifiable manner.[49] But this has not been that kind of journey, and my epigrams have hinted that a state of confusion or 'chaos' may be unavoidable if undesirable—and perhaps not even that. I repeat that I never promised to produce a 'BP theory' of the sort quite reasonably predicted by Sethares.

Having set out to question contemporary music theory to gain some possible understanding of its relation to a potential 'BP theory', I found vastly more uncertainty, ambiguity and contradiction than a superficial study might indicate. Everywhere I looked for some bedrock of certainty, I found doubt and conjecture instead. Again appealing to the antiauthority of Feyerabend:

> Our common knowledge of science may be severely defective. It may be entirely mistaken … In these circumstances, the only safe way is to confess ignorance, to abandon reconstructions, and to start studying science from scratch. We must approach it like an anthropologist approaches the mental contortions of the medicine-men of a newly discovered association of tribes. And we must be prepared for the discovery that these contortions *are* wildly illogical (when judged from the point of view of formal logic) and *have to be* wildly illogical in order to function as they do. (Feyerabend 1975, p. 254, emphasis in original)

[49] Fadades is an 'eccentric' and reclusive French solo 'hyper-metal' performer whose bizarre and cheaply green-screened clips for his disjointed and erratic songs have attracted widespread derision. His MySpace site (https://myspace.com/fadades, viewed 18 December 2019), contains a pseudoscientific gibberish 'formula' (P=C.(I.A) C=I:(I.A)) by which he claims to write all of his material. All of these terms are unquantifiable; 'C', for instance, stands for 'Capacity'. Fadades may be trolling us, but most commentators regard him as sincerely self-deceptive …

Sir Hubert Parry (1848–1918), composer of 'Jerusalem', remarked that 'it is advisable to guard at the outset against the familiar misconception that scales are made first and music afterwards. Scales are made in the process of endeavouring to make music, and continue to be altered and modified, generation after generation, even till the art has arrived at a high degree of maturity' (Parry 1905, p. 16). In the 1950s, composer and theorist Norman Cazden (1914–1980) published an article with the (perhaps Panglossic) title of 'Pythagoras and Aristoxenos reconciled' (Cazden 1958). In this, Cazden expressed his view that the difference between the two theories was ultimately a misunderstanding, and that the Pythagorean principles related to tuning—that is, 'what happens before music is sounded' (p. 101)—whereas 'the judgement of the ear which Aristoxenos upheld' applies to *music*, 'for music begins only where there is a musical system for the collocation of tones, and such a system is not given by external measurements but only by the ear of the musician nurtured in that system' (p. 101).

Whether or not Cazden was correct in his interpretation, he closed with the observation that 'the lesson of the consonance problem is that the data of human activity may not be reduced to the one-dimensional data of acoustics, for arts that are demonstrably subject to the exigencies of historical change in human societies cannot be comprehended by focussing attention on the unchanging natural conditions of their media. The study of music and its laws thus appertains properly to the sciences of the works of man and only incidentally to the contributory sciences of the works of nature' (p. 105). And the fact is that 'the sciences of the works of man' are *hard*, partly precisely because of their resistance to quantification and reductionism.

If this is thought to be either trite or self-evident or both, I would remind the reader of my track 'Tatpara', as discussed on pp. 88-89, in which notes of a 12–ET song were transposed to their closest BP equivalent by frequency, not by function. I suggest that this method should have entirely disrupted the formal tonal relations of the original piece—but not by supplanting it with any formal BP organisation. Nevertheless, everyone who has heard this piece without being made aware of its theoretical basis has unquestioningly accepted it as 'tonal music' of whatever quality they choose to attribute to it. Yet if it is following any 'rules', they are not in a musical grammar present within the BP scale in any of its known manifestations (not even chromaticism). By definition, they are closer in their nature to the frequency basis of the Aboriginal musical systems described by Will and Ellis; yet they still exist within the formal framework of the BP scale as well as BP notes, although not constrained by any existing 'scale' or 'mode'.

These seem to me to be fairly deep mysteries, and it was difficult enough to formulate the right ways to pose the problems in the first place.[50] The 'answer' or 'answers' must await further research, regarding which I will make some tentative suggestions in the next section. In the interim, having all this in regard, I now diffidently propose my second research 'conclusion', as clearly as I can formulate it:

Any attempt to articulate a unique 'Bohlen–Pierce theory' must await and be informed by a more refined and systematised degree of ignorance in and of conventional music theory. It is difficult to predict when this state of affairs will finally occur, but BP researchers must patiently work towards

[50] 'In re mathematica ars proponendi quaestionem pluris facienda est quam solvendi.' ('In mathematics, the art of posing questions is more consequential than that of solving them.') Georg Cantor (cited in Ferreirós 2007, p. 39).

it. It is impossible to predict at this stage whether such a theory is actually achievable, whether it will persist in a stable form if so, and whether such a theory might be desirable and/or useful. We can only try to find out.

4.1.3 Losing the 'Fifth'—and Gaining Something Presently Nameless?

Another quite unexpected outcome of my research was a series of questions about that key element of Western art music—the fifth—and its relationship and possible relevance to the 'BP theory' which I never set out to provide. I felt I had to come to terms with this interval in view of its importance to conventional theory. Yet what was it about the fifth that made it so important anyway?[51]

Superficial answers were easy to come by, but even there a degree of ambiguity is apparent: for instance, Scholes told us that 'the intervals between the keynote and the fourth, fifth and octave of the scale are all called Perfect; they have a hollowness (and perhaps we might say purity) that is quite different from the effect of the other ("Imperfect") intervals' (Scholes [1938] 1991, p. 519). Just *how* this 'purity' is 'quite different from the effect of the other ("Imperfect") intervals', Scholes did not venture to explain, beyond noting later in the article that 'intervals are necessarily either Concordant or Dissonant', but the exact demarcation between them is 'more or less a matter of convention, but the convention is still a thoroughly recognized one and (despite all modern improvements in harmony!) is still one that is to an extent endorsed by most ears' (p. 519). Sir James Jeans, writing at around the same time as Scholes' original work (the late 1930s), referred to 'the minima of unpleasantness' to be found at 'the simple values 5:4, 4:3, 3:2 [the fifth] and 2:1' (Jeans [1937] 1968, p. 153). Regarding *why* this is so, Jeans repeated the 'small-integer ratio = comparative consonance' mantra that he attributed to Pythagoras, but he could only conclude that 'although many attempts have been made to answer it, the question is not fully answered yet' (p. 154).

Helmholtz had already offered an answer; in his view, the 'consonance' of the fifth resulted from its being 'a perfect consonance, in which there is no sensible disturbance of closely adjacent upper partial tones' (Helmholtz [1885] 1954, p. 188). Partch, of course, vehemented that 'the smaller the numbers of a ratio the more consonant the interval, a principle … as ancient as almost any precept of man' (Partch [1974] 1979, p. 151). One would love to know, given this 'ancient principle', what Partch made of the 3/1 ratio when he came across it, as presumably he must have somewhen. (After all, Helmholtz clearly listed it as the second-most consonant interval, after the octave and before the fifth, on p. 183). Yet it does not appear in Partch's list of 'Ratios of 3' on p. 73 or anywhere else in his book as far as I can see. Did he simply reject it as being outside of his chosen compass, perhaps without ever considering its broader implications?

Hindemith said that 'the interval of the pure fifth is so unambiguous and independent that it is to be found in nearly every scale system' (Hindemith [1885] 1954, p. 15). Pierce wrote a textbook in which he repeated Helmholtz's explanation (Pierce 1983, p. 79). But against this are arrayed a number of 'equal and opposite experts'. Parry observed that 'in our own system [12–ET] the fifth is less in tune than in many other systems, and in the Siamese scale there is nothing like a perfect fifth at all. The fourth is an interval which is curiously universal in its appearance, but that, again, does not

[51] 'To promote a youthful vitality in music we must have students who will question every idea and related physical object they encounter' (Partch [1974] 1979, pp. xiii–xiv). Including those of Partch himself!

appear in the true Siamese scale, or in one of the Javanese systems' (Parry 1905, p. 17). To this he added that 'a modern musician would say instantly that it was impossible that any beings could have chosen the fourth as their first interval ... But nevertheless the fact remains that it is more often met with than the fifth in barbarous scales' (pp. 17–18) because 'our scale has had to be transformed entirely from the ancient modes in order to make the harmonic scheme of musical art possible ... All other systems in the world are purely melodic ... And their scheme of æsthetics is totally alien from such a highly artificial and intellectual development as that of modern European music' (p. 18). (Parry attributed the prevalence of the fourth to the ease in arriving at it in melodic, voice-based practices that develop the scale downwards, where 'it is perfectly natural and easy to hit the element of the fourth' (p. 19).)

Leaving aside Parry's blithe dismissal of the music of half the world of his day as 'barbarous', the fact remains that there are precedents for scales that do not employ an interval of a fifth. A recent paper on consonance by Josh McDermott (whom we have already met in conjunction with the musical preferences of the Amazonian Tsimane') and others mentions that 'ancient thinkers viewed consonance as determined by ratios ... but in modern times ... dominant contemporary theory posits that dissonance is due to beating between frequency components' (McDermott et al. 2010, p. 1035). The 'special' properties of the interval of the fifth are attributed by them to 'frequencies that are approximately harmonically related ... not every component of the harmonic series is present, but each frequency corresponds to a harmonic. In this respect the fifth bears some resemblance to an individual musical note, whose frequencies are generally a series of harmonics, the F_0 of which corresponds to the pitch of the note' (p. 1035). In finding that 'harmonicity plays a key role in the perception of consonance', the authors also claimed to have circumvented the problems with previous studies, where 'debates over consonance have remained unresolved because the candidate theories often make similar predictions and because models of the candidate mechanisms hinge on assumptions and parameters that are difficult to verify' (p. 1040).

Somewhat on the other side of the fence, Parncutt and Hair joined in the critique of previous studies, but they also made the reasonable point that 'of course the most important musical intervals in Western music and many other musical systems are P8, P5 and P4, in that order. Of course their tuning corresponds approximately to 2:1, 3:2 and 4:3 respectively ... But that does not necessarily mean that they are *perceived as* ratios, [and] if intervals are not perceived in that way, they cannot function in music that way' (Parncutt & Hair 2018, p. 476, emphasis in original). They went on to criticise the just-mentioned harmonicity principle in practice, observing that, for instance, 'the inharmonicity of very low piano tones can change their pitch by as much as two semitones' and that 'the word "fundamental" should therefore be excluded from a definition of intonation' (p. 477). In regard to this issue, they concluded that 'intonation becomes undefinable in purely physical terms', and '"pitch" ... is a purely subjective parameter' (p. 477). In any case, twisting the knife, they pointed out that 'a pure tone can evoke a different pitch in each ear, an effect known as binaural diplacusis', and 'the mainstream psychoacoustic literature of the past two decades has downplayed the importance of pitch shifts ... Reflecting a general reluctance (at least in the English-speaking research community) to investigate the phenomenon in more detail, in spite of its evident importance for a general understanding of pitch perception and for the quantitative testing and comparison of competing pitch theories' (p. 478). 'It follows', they concluded, 'that there cannot be a physically "perfect" tuning for any given interval, because if there were, our perception of it would change as sound levels changed, or as the interval was heard in different contexts, or depending on which ear

we heard it with. This contradicts the Pythagorean concept, in which interval sizes are held to be exact and constant' (p. 479).[52]

And yet the fifth—whatever it really is—is there and is clearly important, for whatever reasons. *How* important is it?[53] Parncutt and Hair seemed willing to concede some significance to the role of harmonicity in their psychocultural theory, and we have just seen McDermott et al. emphasising this factor in recent research. Helmholtz defined a 'perfect' interval as one in which no beating was apparent in the upper partial tones (Helmholtz [1885] 1954, p. 181), and on the evidence of experimental sirens, he went on to assign the usual ratios to these intervals, namely the 'perfect' octave, twelfth and fifth (although Parncutt and Hair adduced evidence of listener preference for a 'stretched' octave of more than 20 cents higher than the ratio, and in some cases as much as 50 cents or a quartertone (pp. 480–481)—and we also have Voisin's evidence of non-octave preferences in Central African musicians). Hindemith, as we have seen, inherited Helmholtz's interest in combination tones and built an elaborate music theory on their basis, which is outside our ambit, except to the extent that it subsequently inspired Bohlen's investigations.

Bohlen ranked his intervals—including odd-integer intervals—in order of consonance, according to his 'gestalt' theory of combination tones (using a method defined in Bohlen 2001, p. 618, footnote 5) in the following order:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1/1	2/1	3/1	3/2	5/2	4/3	5/3	5/4	7/3	7/4	8/3	6/5	7/5	9/4	8/5	9/5	7/6	11/4	11/5	9/7

Table 7: Bohlen's Consonance Rankings (simplified, after Bohlen 2001).

As shown, the fifth occupies position 4, just after the 3/1 at position 3. The next odd-order entry after that is the 5/3 at position 7. Is this what one might take to be the BP equivalent of a 'fifth' on 'consonance' grounds? Perhaps. The preceding interval, 4/3, is taken to be the basis of a perfect fourth in 12–ET, and the 5/4 directly after it is the major third in the same way. The 5/3 also appears in the 12–ET scale as the basis of the major sixth, but Bohlen used it as the second element in the sequence 1/1–5/3–7/3 as 'the base of a new scale, a triad that has its foundation in odd-order non-linearity as clearly as the major triad is based on even-order non-linearity' (Bohlen 2001, p. 621).

Mathews and Pierce accepted the same foundational structure, although for different reasons (see pp. 8-9). They included a table in which they pointed out the similarity between various BP ratios and other ratios now in use in 12–ET (Mathews & Pierce 1991, p. 167). Six of these BP ratios resemble 12–ET ratios, but the average similarity is 26.78 cents—not especially close. However, only the 5/3 ratio is considered to 'resemble' itself in both scales, and with a similarity of –6.4 cents. Here we have

[52] Perhaps wittingly echoing the iconoclastic work of Sextus Empiricus, Parncutt and Hair listed a series of objections to the 'measurement' of frequency from recordings—one of the governing presumptions being that 'each tone in a performance contains a central, steady-state portion, whose start and end can be identified and whose frequency corresponds … to the performer's intention' (p. 479).

[53] Certainly, the interval is present or at least implicit in some of the oldest surviving instruments that can be reliably tested—a collection of bone flutes from a site in Jiahu, China, occupied by the Peligang culture (or a closely related group) 9,000 years ago (Zhang et al. 2004). (Much older instruments exist elsewhere, but analysis of their tuning is contested.) The article noted (p. 775) that flutes were tuned carefully and to each other, implying their use in ensembles.

the first hint as to how and why I may have 'goofed gloriously', as R. A. Lafferty put it in that strange book *Fourth Mansions* (Lafferty [1972] 1977). Mathews and Pierce noted that the similarities 'may have a distracting effect in listening to BP scales and music, especially for musicians' (Mathews & Pierce 1991, p. 167). This observation has been repeated by a number of other BP theorists, leading to my informal terming of the possible property as 'The Ouch Factor'; formally trained musicians not only appraise BP triads differently to a control group, but they also tend to object more strongly to BP music as 'dissonant'. Although the 5/3 ratio is, perhaps, a 'logical' candidate for a 'fifth' in BP, as Parncutt and Hair (2018) put it, 'musical intervals … are learned, approximate, perceptual distances' (p. 492). If this is true, then the 5/3, as the closest ratio in tuning to a learned 12–ET interval, may be the 'ouchiest' of the tones—at present, and under the present perceptual circumstances, where formally trained musicians learn just such approximations to an extremely (and perhaps even excessively) precise degree.

Although my initial avoidance of the ratio is more due to dumb luck than consciously informed choice, it is interesting to examine this from another perspective, admittedly post facto.[54] Müller, Orlandatu and Hajdu (2014) offered a variety of assessments of the 'consonance' of BP intervals using a variety of methods. On p. 166 they offered a table of BP intervals, assessed by playing two simultaneous tones to a test audience and averaging their various responses, which were grouped from 1 to 5, where 1 is 'dissonant' and 5 'consonant'. Diagrammatically, we have this:

Interval	0	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th
		1.50	3.60	2.60	3.00	2.55	4.25	3.25	2.40	2.15	3.10	4.25	2.30	5.00

Table 8: Müller et al.'s consonance ratings.

If one then maps these against the ratios used in the BP chromatic scale, one sees this:

Step	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Ratio	1/1	27/25	25/21	9/7	7/5	75/49	5/3	9/5	49/25	15/7	7/3	63/25	25/9	3/1
		1.50	3.60	2.60	3.00	2.55	4.25	3.25	2.40	2.15	3.10	4.25	2.30	5.00

Table 9: Müller et al.'s consonance ratings with BP ratios.

As shown, our candidate for the BP 'fifth', the 5/3, is certainly in these terms, which rest on the debatable proposition that these notes are being judged with reference to a fundamental either present or implied—the second-most consonant interval after the tritave, perceived as having maximum consonance. Yet, as we have seen, there may be other psychoacoustic problems with this ratio—in particular, that due to its strong similarity to the same ratio used in the 12–ET scale as the minor sixth, upon hearing it, one is being pulled away from BP back to a 12–ET relationship, and moreover, one that is in the 'wrong' place in the scale. (We also note that it is judged only as

[54] 'I'd rather be lucky than smart *any* day!' (J. R. "Bob" Dobbs as cited in Canobite 2019).

'consonant' in these terms as the 63/25 in any case; the latter is a seven-limit ratio in Partch's terms and therefore supposedly *less* 'consonant' in that sense.)

If we now examine only the ratios being used in the first expression of the Vathek scale or mode—the only one I have had time to conduct any substantial experiments with—we see what happens in these terms when we 'lose the fifth' *and*, possibly, its (presently) undesirable psychodynamic baggage:

Step	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Ratio	1/1	27/25			7/5	75/49		9/5	49/25		7/3	63/25	25/9	3/1
		1.50			3.00	2.55		3.25	2.40		3.10	4.25	2.30	5.00

Table 10: Consonance ratios of the Vathek mode.

One can see that, whether by dumb luck or perhaps unconsciously under the same benign influence that led me to consider analogies with 'Mediterranean tonality' in the first place, one is left with some perfectly acceptable replacements for scale expression, including the 9/5 and the 7/3, which (along with the now-missing 5/3) completed Bohlen's triad in the first place (and of course the 63/25). (In fact, Bohlen ranked the 7/3 ninth in overall consonance himself, two steps below the 5/3 at seventh. Between them he places the 5/4, which is the basis of the 12–ET major third.) Whether the significance of a 'fifth' is created more by its place in a scale or the various (and contesting) definitions of 'consonance', or equally by both and perhaps other factors, I do not pretend to presently know.[55] At any rate, to formally state my third research conclusion:

Largely by chance (I *think*), I have expressed an entire corpus of Bohlen–Pierce music that very largely omits the interval considered one of the best possible analogues to the 12–ET fifth. And yet it works. I have offered several possible explanations for the success of this gesture; none of them satisfy me entirely. Generally and very broadly, I would take this as suggesting that analogies drawn from 12–ET music theory may not be the most productive approaches to either a BP music theory or practice, at least at the present. **This supports Sethares' suggestion that BP may require its own unique theory.**

4.1.4 On Timbre and Idiom

Regarding timbre, I have little useful to say. The suggestion has been noted that, on theoretical grounds, timbres favouring odd harmonics should be 'preferable' in BP music. I can only state that I have not, as yet, generally found this to be so.

There are caveats to this 'finding'—first, while the instruments I built were generally designed to maximise the propagation of odd-order harmonics, as already noted, for sundry practical reasons they did not find much use in the final 'deliverables'. I find it hard to reach any firm conclusions about these instruments one way or another for this reason. Second, because of this, a large

[55] Although it is an interesting exercise to compare these results with, for example, the BP 'dissonance curve' featured by Sethares (2005, p. 112, Figure 6.9). Certainly, this is a field in a state of some nascency.

proportion of the final 'deliverables' were completed using sample libraries—much more so than I originally intended. This raises the question of idiom more than that of timbre, at least in a way. For example, the South Appalachian court music track 'Krantipatagiti' was created using the software package 'Mus2', a microtonal application created by Utku Uzmen and M. Kemal Karaosmanoğlu, primarily for the creation of Turkish makam music, but as we have seen, it is capable of far more than even that laudable goal. The track was rendered within Mus2, partly because I was dubious about one aspect of the software, namely its assurance that its micro- or macrotonally 'bent' MIDI renders would be accurately replicated by any other system the files were loaded into. After many disappointing experiences with other software I had learned to be cautious, and I have not had the time since to test the promise in practice.

So the track was rendered *in situ* using the Turkish instrument samples provided with the software. As already described, a tuned percussion track was subsequently added using a retuned percussion synthesizer in Logic Pro X—a gratifying assurance that the different methods worked properly when put together—but as far as any timbral aspects go, to the extent that the track is held to 'work', it does so on the basis of the pre-existing timbres of the Turkish classical instruments that were sampled.[56] This of course follows on from Bohlen's observation on his refretted acoustic guitar that the complex timbres, which presumably included even-order harmonics, were not necessarily destructive to BP apprehension. This in turn contradicts other, more favourable reports of odd-harmonic instruments in a BP context. This implies that music perception is, as per Parncutt and Hair again, an extremely complex matter in which 'the inherently approximate nature of musical intervals arises from the circumstances and processes of their perception and cognition' (Parncutt & Hair 2018, p. 485). I wonder whether this observation about intervals might also apply to timbral perception, at least to an extent.

Despite these misgivings, I arranged with my supervisor to explore the possible significance of odd-order timbres in the music of Sūrmi (North Appalachia). Given the extensive use of sample libraries, the only way that this could readily be done was to use a third-party filtering application. The only one I could find that answered the need was the HorNET Harmonics plugin, which permits the user to dynamically enhance or reduce the particular harmonics of a signal.[57] Trying this on various Sūrmian tracks did not do anything beneficial to my ears—in fact, more the contrary—and so I rapidly discontinued its use. This may not say anything of consequence about timbres in specifically designed instruments, but in the parameters I was forced to work with, it appeared that emphasising odd-order harmonics was not necessarily a useful path to follow.

I suspect that the success (if conceded) of these tracks is more due to their idiom than issues of timbre. This is a much less quantifiable property even than timbre, but in an æsthetic program, perhaps it is licit to at least discuss it. My best guess at this stage is that—perhaps together with the 'avoidance of the fifth' discussed above—the 'fake-folk' idiom of many of the pieces predisposes the listener to almost instantly classify these works in the context of 'world music', from which greater tonal flexibility is to be expected. An interesting exercise in this context is to first render one of these tracks

[56] A preliminary analysis of the Turkish tanbur, a long-necked instrument of the lute family, suggests that regarding the string, 'the second harmonic has a relatively low initial level but the amplitude gradually increases with time', and regarding the soundboard, 'the second harmonic has a higher initial amplitude level than the first one and also a very sharp attack' (Erkut et al. 1999, p. 7). But this is, of course, a *preliminary* analysis of *one* instrument …

[57] https://www.hornetplugins.com/plugins/hornet–harmonics/

in the various 'world' samples I have been disposed to use (particularly the instruments included in the 'Discovery Series: Middle East' sample packs included in the Native Instruments Komplete package) and then to render exactly the same music in more conventional orchestral samples. Again, to my admittedly subjective ear, the results are startling and immediate; even in melodic or heterophonic tracks, the 'Ouch Factor' tends to re-emerge instantly, even in the Vathek mode. In consequence of these considerations, I draw a fourth and final research conclusion:

In my own practice, at least as far as this project is concerned, idiomatic factors appear to be more significant than timbral factors in determining æsthetic outcomes. The exact reasons for this are unknown at present and await further research.

4.1.5 'Cultural Misappropriation'?

It might be objected that these instruments—the Persian/Iranian ones in particular—are being wrenched out of their 'proper' context to fulfil a purpose for which they were not originally intended. This may be so—but if this is the case, it surely applies equally to the 'Western' instruments and samples that have been adapted in the same way. More generally, these issues inevitably lurk in the background, at least, of this project in toto—in which 'heterophonic' concepts have been 'borrowed' from 'Mediterranean tonality'. The whole rather elastic concept of 'modal' music has been hazily invoked from similar sources, and an entire non-human musical culture has been created to compile these gestures into a single act of pastiche, musical and more generally cultural, in itself. These might be considered acts of 'appropriation'—but is the whole project possibly greater than the sum of its parts? At least as many ideas, from Western art music and elsewhere, have been *rejected* as have been 'appropriated'. The BP scale is a new phenomenon, and as Müller et al. pointed out, it has no centuries-long tradition either of theory, research or practice in performance or instrument-making to substantiate a body of conclusions. I regard a tentative gesticulation in the direction of melodic, monophonic and/or heterophonic 'world music' traditions as possibly one of my more important research contributions in this context. This is not to say that they must necessarily be expressed in the rather literal manner that I have employed, of necessity, in my own guesswork. Xenakis spoke (with his usual astuteness) of a 'substratum' underlying contemporary music theory, which 'is what will allow us to establish for the first time an axiomatic system, and to bring to light a formalisation which will thus unify the ancient past, the present and the future; moreover it will do so on a planetary scale, in other words embracing the still separate universes of sound in Asia, Africa, etc.' (Xenakis 1970, p. 3). Perhaps eventually this substratum will be found to exist. In any case, I would like to think that my 'appropriations' were intended with this sort of goal in mind—exploring a possible new musical vocabulary rather than misappropriating 'Eastern' materials to serve a 'Western' end. (In fact, and of course, the absence of a long-standing BP tradition to parallel that of Western art music is of interest in presenting just such a potential to the open-minded explorer.) But posteriority—and the examiners—must be the judge of this matter in the context of this project.

Xenakis (1970), after praising himself for having 'denounced *linear thought* (polyphony), and demonstrated the contradictions of serial music' (p. 3, emphasis in original), and putting forward in their place 'a world of sound-masses … which required definitions and calculations using probability theory' (p. 3), pointed out that despite his 'stochastic music', 'the tempered diatonic system—our musical "terra firma", upon which all our music is founded—seems not to have been breached either by reflection or by music itself. This is where the next stage will come' (p. 3). It is suggestive that

Xenakis was musing on this just as Bohlen was setting off on his voyage of discovery to this very destination. However, Xenakis, repeatedly saluting 'Aristoxenos's wisdom' (p. 6), asserted that 'Byzantine music amalgamates the Pythagorean and Aristoxenian' (p. 7) and that it is 'the most complex and most refined thing that could be invented by monody' (p. 11).

Denouncing polyphony again as 'a highly original invention of the barbarous and uncultivated Occident following the schism of the churches' (p. 12), Xenakis nevertheless cautioned that 'these ancient and Byzantine models cannot serve as examples to be imitated or copied' (p. 13). Instead, they point towards 'a fundamental outside-time architecture which has been thwarted by the temporal architectures of modern (post-medieval) polyphonic music' (p. 13). Further, he feels that 'we must open our eyes and try to build bridges towards other cultures, as well as towards the immediate future of musical thought, before we perish suffocating from electronic technology, either at the instrumental level or at the level of composition by computers' (p. 14).

We cannot discuss Xenakis' proposed 'axiomatic scales' in any detail here, or his declaration that his 'sieve theory' 'can unify the expression of fundamental structures of all Asian, African and European music' (p. 18). The point here is that, at least to an extent, these draw upon his studies of Ancient Greek and Byzantine music—although Xenakis denied any direct influence, and it is difficult to ascertain an obvious influence on his works from that point. I would like to think that, in my own way, I was stumbling in the same general direction in the discovery of the method that underlies certain 'sacred music' tracks of all three islands. By this, I particularly mean the 'controlled feedback' method that underlies the track 'Vṛkatātviśvavidyālaya'. This is presented as being the only available analogue to the mentally produced music of the Laramidians, but in reality, it is created by a process of careful juxtaposition of instruments and related amplifiers, whereby patterns of reinforcement and cancellation of feedback and harmonics are achieved in a semi-improvised way. But—and this is my point here—this piece is performed in the Vathek mode, and this might be as little apparent to a casual listener outside the idiomatic context as the theoretical foundation of Xenakis' works was in some of the ideas set down by Aristoxenos so long ago. To this extent, perhaps we are glimpsing a future in which BP music (if it persists) develops its own means of expression. Certainly, my 'symphrovisation' approach can be applied to other tuning systems, but it was applied to BP first.

The same observation applies to another aspect of the 'sacred Laramidian music'—the process I call 'spectral subtraction'. This is a method by which all of the frequencies except those extremely close to a target set of BP frequencies are removed from a recording by a process of spectral editing, as in the track 'Mattavāraṇa'. I have experimented with this idea—which perhaps originates in a combination of the influences of Scelsi, Grainger's Free Music and the works of the 'non-school' who prefer *not* to be known as 'The French Spectralists'—for some time, but the first significant success I experienced with it occurred when the method was applied to a short recording of an extremely drunken audience member at one of the gigs of my comparatively conventional 'rock' band. This sizeable gentleman had rather truculently appropriated the vocal microphone while we were setting up. He thereupon used it to perform a spontaneous and spectacularly off-key rendition of a popular tune. Subtracting all the frequencies from this track that were not in the Vathek mode transformed the material completely. It became a gently varying series of what sounded like near-

pure sine tones and was really rather attractive, especially considering its origin.[58] This of course became transformed in presentation to the 'purely mental music' of the Laramidians, where their advanced mental powers were capable of filtering out unwanted frequencies in environmental sound and thereby metamorphosing *anything* sonic into music. And indeed this method can be applied to practically any recording with a complex timbre.

No doubt this 'spectral subtraction' method is not an original invention—presumably it has been stumbled upon many times already, and for anything I know to the contrary it may be in widespread use—and again, it can be used for other systems than BP. (It also deserves consideration inasmuch as it effectively eliminates 'harmonics' from the tonal scheme, except insofar as they appear as other BP tones.) But again, BP was where I applied it first, and I certainly had no information of other inventors when I did so. It seems to me that perhaps these are foreshadowing some new developments that other explorers may eventually particularly apply to BP, perhaps to the point where it truly does evolve its unique theory, if only as a result of attempts to explain these sorts of æsthetic results after the event. This, of course, is rank empiricism, and Parncutt and Hair pointed out that the Marxist theorist György Lukács denounced 'empiricism as an ideology of the bourgeoisie' (Lukács 1971), 'perhaps fearing that empiricism would prove him wrong' (Parncutt & Hair 2018, p. 475—they also approvingly cited the 'conservative' philosopher Roger Scruton on p. 494), but aside from these contemporary (and presumably passing) political quarrels, Xenakis (himself an ex-Communist) said, on Bohlen's authority, that 'the theory is not the foundation of music; rather, the æsthetic result is the foundation for the validity of the theory' (Xenakis as cited in Bohlen 2001, p. 624).

With this, I finally fall silent on this subject, at least, and respectfully direct the reader towards the recordings accompanying this document.

[58] Unfortunately, given the copyright nature of the source material, it was thought better to exclude this track from the recordings. (It is listed as Item 12 in Appendix C.)

Part 5: Aftermath (Inconclusion)

A Conclusion is Simply Where You Stopped Thinking.
Discordian Society

> Thus—thus, my fellow-labourers and associates in this great harvest of our learning, now ripening before our eyes; thus it is, by slow steps of casual increase, that our knowledge physical, metaphysical, physiological, polemical, nautical, mathematical, aenigmatical, technical, biographical, romantical, chemical, and obstetrical, with fifty other branches of it, (most of 'em ending as these do, in *ical*) have for these two last centuries and more, gradually been creeping upwards towards that Ἀκμή of their perfections, from which, if we may form a conjecture from the advances of these last seven years, we cannot possibly be far off.
>
> When that happens, it is to be hoped, it will put an end to all kind of writings whatsoever;—the want of all kind of writing will put an end to all kind of reading;—and that in time, *As war begets poverty; poverty peace*,—must, in course, put an end to all kind of knowledge,—and then—we shall have all to begin over again; or, in other words, be exactly where we started.
>
> Laurence Sterne, *The Life and Opinions of Tristram Shandy, Gentleman*

> That the cosmos is ordered by a 'universal harmony' is proven false in a number of ways; and even if it was true, how would it make us any happier, any more than harmony in music does in itself?[59]
>
> Sextus Empiricus, *Adversus Musicos*

5.1 'THE ACME OF OUR PERFECTIONS'

This process has been a long, intricate and challenging one. Although its primary intention has been creative, the research question has taken us into liminal areas where psychoacoustics, music cognition, creative practice and philosophies of mind and music all overlap. Such territory is notoriously fertile, but the question of categorisation also arises within it. While the processes within the doctorate have been partly what one might call 'scientific', at the same time there is no easily quantifiable method of measuring 'success' or 'failure' in creative outcomes—even those relying on practices derived from, say, psychoacoustic data.

And so, by way of anticipation, I refer to an interesting guide for *'Examining Doctorates in the Creative Arts'* published by the Australasian Association of Writing Programs (Webb, Brien & Burr 2012). This document drew on a series of round-table discussions with interested parties, and it reported a consensus 'that candidates under examination are our future colleagues and, thus, are

[59] Τὸ δὲ κατὰ ἁρμονίαν διοικεῖσθαι τὸν κόσμον νοικίλως δείκνυται φεῦδος, εἶτα καὶ ἂν ἀληθὲς ὑπάρχῃ, οὐδὲν τοιοῦτο δύναται πρὸς μακαριότητα, καθάπερ οὐδὲ ἡ ἐν τοῖς ὀργάνοις ἁρμονία (Empiricus 1986 27, p. 154).

being mentored as much as assessed' (p. 5). In discussing what examiners might look for, it raised questions regarding whether the thesis/exegesis/dissertation 'offer[s] an original contribution to knowledge in the field .... Advances knowledge and not just practice .... [And is] as a whole scholarly, coherent and rigorous' (p. 6). I suppose it is incumbent on me to try to assess my own work in this context.

Looking again at the research question: 'Are there ways in which creative explorations of the Bohlen–Pierce scale can offer an effective context and/or impetus for the creation of new musical works?', we have seen that, particularly in Part 4, where my 'inconclusions' are summarised, I have offered a series of smaller conclusions without addressing the broader issues raised by the research question as a whole. These are:

1.) **Attention to non-Western musical idioms can provide useful material for practical BP expressions.**

In the course of finding ways to develop practical expressions of BP music, I have been guided by examples outside Western art music. These idioms have contributed to a unique BP idiom that I have developed, which includes, but is not solely defined by, the Vathek modes. (In practice, I could not explore more than the very surface of this rich new field.) The musical challenges and opportunities offered by this treatment of the scale testify to the value of this approach to creativity.

2.) **Any attempt to articulate a unique 'Bohlen–Pierce theory' must await and be informed by a more refined and systematised degree of ignorance in and of conventional music theory.**

As Feyerabend stated, 'what appears as "sloppiness", "chaos" or "opportunism" when compared with ["the laws of reason"] has a most important function in the development of those very theories which we today regard as essential parts of our knowledge of nature. *These "deviations", these "errors", are preconditions of progress*' (Feyerabend 1975, p. 179, emphasis in original). The fact that the BP scale 'lacks' a strong theoretical grounding at present—the 'lack' presuming both the existence of and the need for such a grounding—has led to my having to reappraise the concept of fixed tuning within Western art music more broadly. This unanticipated questioning of aspects of music theory that might have been thought to be canonical, and even indisputable, has resulted in a greater sense of freedom within the creative compositions accompanying this exegesis.

3.) **Largely by chance (I *think*), I have expressed an entire corpus of Bohlen–Pierce music that very largely omits the interval considered one of the best possible analogues to the 12–ET fifth. And yet it works ... This supports Sethares' suggestion that BP may require its own unique theory.**

The sense of being able to 'play' with tonality, which was an outcome of the theoretical component of this study as outlined in conclusion 2 above, has resulted in a freer approach to melodic construction in these works. Without being constrained by hierarchies of musical

convention, the very absence of a unique BP theory of the type proposed by Sethares may prove to be a compositionally useful factor in the future work of others in this system.

4.) **In my own practice, at least as far as this project is concerned, idiomatic factors appear to be more significant than timbral factors in determining æsthetic outcomes. The exact reasons for this are unknown at present and await further research.**

My gradual deemphasising of the timbral constraints proposed by such BP theory as currently exists had the practical result that I felt at liberty to experiment with works that ignore such theoretical considerations in their constructions. I do not say that the odd-order timbral factors are altogether irrelevant to BP practice; I can only offer the empirical observation that in *my* practice, in this particular creative context, they have not appeared to be of fundamental significance, in that tracks that ignore this constraint did not sound 'wrong' to me. I am not presently willing to offer 'decisive' speculation as to why this may be so, beyond my tentative observation, already made, that the general idiom of a track may be at least as significant to its perception as its timbral profile.

Where these smaller conclusions are considered against the research question as a whole, it becomes possible to formulate a general answer of sorts to the question. One approach might read something like this:

> **In this study, the BP scale has offered an effective context and impetus for the creation of new musical works in the following significant ways. 1) Framing the articulation of a new family of 'Mediterranean'-influenced modes that 2) seem particularly suited to work in a monophonic and/or heterophonic context, as this 3) avoids some of the harmonic issues that *seem* to create perceptual tension by 'reminding' listeners too much of the 'old' harmonic relationships associated with 12–ET. 4) Exploration of the BP scale suggests that a focus on idiom appears to be more significant than timbre, at least in my practice up to this point, and that where timbre is relevant to my work, it is more relevant in terms of individual instrumental idioms than in the broader harmonic spectrum. I have also found that in the practical deployment of the BP scale, 5) the avoidance or minimisation of one particular interval, the 5/3, which is a possible analogue for a BP 'fifth', might be presently advisable, as it is also the basis of the 12–ET minor sixth and is possibly confusing listeners on that basis.**

Well, that is *an* answer, anyway. Of course, it only relates to the present state of BP tonality and practice, which after almost half a century of life is still a field at the very beginning of its creative exploration and musical applications. There are almost too many issues raised by this research in psychoacoustic and theoretical areas to be easily summarised. The body of this document contains many scattered observations of my own and other researchers that could easily form the basis of more than one research program in music perception. For example, it would be interesting to probe the question I have raised of the *seeming* relative insignificance of timbre in practical BP musical expression in a more formal psychoacoustic context, as distinct from theoretical research. Am I simply wrong, or is the process of practical musical apprehension as malleable and psychocultural as

Parncutt and Hair suggested? Are timbres that seem 'disturbing' in an isolated interval less so in an actual song, and if so, why? Is it a question of focus of attention? Of context? Of complexity?

Nor is 'my' way the *only* way, by any means—for example, as stated elsewhere, of the masses of members of the Vathek family of modes, I have investigated exactly one in any detail, and as far as I know, the majority of the 45 'basic modes' of the BP family remain almost as unexplored today as when I sounded each of them in a one-minute improvisation on one random tonic back in 2015. Van Prooijen's modes have also remained almost unexplored, and they deserve further attention as well. A growing number of people are working or starting to work creatively in BP, and it is possible that BP will be found to be a viable means of creative expression in the future, hopefully around the world and with input from many different musical traditions. Of course, it is also possible that it will become a forgotten sideline in the history of music, until perhaps it is rediscovered centuries in the future, whereupon as Sterne has it 'we shall have all to begin over again; or, in other words, be exactly where we started' (Sterne [1759–1767] 1967, p. 88).

But perhaps not. I know I have been accused of total or academic scepticism about music theory, and I hope I have sufficiently disabused that impression with my discussion of the matter in Section 2.1. The ironic fact is that Sextus Empiricus' attack on music theory in *Adversus Musicos* is itself a disproof of the 'no progress' claim; surely the publication, preservation, rediscovery and interpretation of this 'sceptical' material is an instance of *progress* in music theory in itself? Similarly, if I have not been able to provide any easy answers to some of the issues raised by a still-putative BP theory, perhaps at least some of the questions I have raised will be of some use to future explorers, if only to save them going over the same ground again. Perhaps motion that might appear circular from the centre of its origin might also appear to be occurring in a spiral 'upwards' from an external standpoint, and perhaps that 'upwards' motion of whatever magnitude is in a trajectory that is consistent with that of 'an original contribution to knowledge in the field'. I certainly hope so. τῇ καλλίστῃ.

> I performed first the music calculated to awe; and you were frightened as if by a ghostly visitation. I followed it with that calculated to weary; and in your weariness you would have withdrawn. I concluded with that calculated to perplex; and in your perplexity you felt your stupidity. But that stupidity is akin to the Dao; you may with it convey the Dao in your person, and have it (ever) with you.
>
> *Zhuangzi* (Legge translation)

Figure 48: Goodbye.

APPENDICES

APPENDIX AI: LARAMIDIA

A.1.1 Discordian Disclaimer

In this Appendix, fact and fantasy will intermingle to an extent. I make no apology for this—it is an outcome of a process of practice-based research that was supposed to stay safely in the liner notes to the recording, but which has somehow inexorably and incontinently spilled over into this document. I could simply and snidely cite the antiauthority of Feyerabend again to justify this practice, [60] but I will also go a little further. Barbara Bolt, Associate Dean of Research at the Faculty of Fine Arts of the University of Melbourne, convincingly argued that in creative arts research, 'the quest for the new persists as a source of anxiety and obsession', but she astutely added that 'we cannot consciously seek the new, since by definition the new can not be known in advance' (Bolt 2006, p. 7). In this context, 'the exegesis offers a critical role. Rather than just operating as an explanation or contextualisation of the practice, the exegesis plays a critical and complimentary role in revealing the work of art' (pp. 7–8). As Professor Clive Barstow noted, 'it is just a matter of time before alternative approaches to research and creativity assume their own voice and not as a variation of others' (Barstow 2017, p. 1), and 'reading and critiquing between the lines is often more fruitful for the artist than accepting existing knowledge as a basis for thematic jump-off points' (p. 2). 'Within the exegesis', Barstow added, 'the artist should not in my mind force a single writing style. The various chapters may demand shifts in style that help accommodate the various components of the creative praxis. These often include descriptive, poetic, reflexive, analytical, contextual and narrative approaches to writing' (p. 3).

Barstow recommended adding a 'prelude to each of the chapters so that the examiner understands your intentions' (p. 3), and so here it is in this one case. In the quasi-imaginary account of the 'history' of 'Laramidian' music that now follows, elements of historical fact and fiction are combined. This document is intended for a highly intelligent readership that is assumed to be capable of understanding irony when they see it, but for the sake of good form, I will be explicit. Everything that will be presented regarding Madame Blavatsky and other Theosophical authors is a matter of asserted historical fact in the sense that their claims, however seemingly absurd or even gelastic, are reported just as they made them. Every Theosophical work cited here actually exists and has been quoted as carefully as every other text in this exegesis. They are all appropriately detailed in the bibliography. The history of the Theosophical Society, grotesquely selcouthan as it may seem at times, is reported accurately throughout, including their persistent (and still-maintained) claim of the existence of the immortal 'Ascended Masters'. There are tens of thousands of practising Theosophists around the world today who hold these beliefs with the utmost seriousness, to say

[60] "Why should scholarly books be dry, impersonal, lacking in frivolity? The great writers of the 18th century ... called a spade a spade, a fool a fool and an impostor an impostor. Scholarly debates were still very lively in the 19th century, the number of insults occasionally rivalling the number of footnotes ... [Then] language became as colourless and as indistinct as the business suit which is now worn by everyone, by the scholar, by the businessman, by the professional killer ... I do not know how the change came about though I suspect that the 'great men' of today being dimly aware of their dwarfish nature encourage ways of writing that are equally colourless so that by contrast they may still appear to have some signs of life. I do not see any advantage in this procedure and I do not see why I should accept it as a *fait accompli.*" (Feyerabend 1982, p. 150)

nothing of the enormous influence that these ideas have exerted and continue to exert on the 'New Age' movement more generally. And if we cannot believe these things ourselves, and even feel compelled to chuckle, we are also not setting out to deliberately offend or wound. After all, Zeteticism compels us to admit that they may be right!

The continent of Laramidia did exist, in a paleontological sense, in the manner and at the time described. The name 'Laramidia' comes from paleontological research; its explicit connection to the Second Root Race of the Theosophists is a venture of my own. The new 'Ascended Master', Jāgand Mara, is entirely a product of my own imagination, as is the infamous *Journal of Sciosophic Pseudoethnomusicology* (as its name should suggest) and the sixteenth-century book 'cited' on the frontispiece. (I apologise in advance for Jāgand Mara's bad language, but like Blavatsky, that is just how he is.) The Church of the SubGenius is a real entity in the sense that it has for many years pursued a more-or-less obscure existence, mostly online, as a 'parody religion', and many SubGenii also identify as Discordian and vice versa.

The telepathically dictated *Lessons of the Ascended Master Jāgand Mara*—the source of most of our 'information' about the social structures and customs of the Laramidians—does not presently exist anywhere except in my own imagination, as implied by the fact that it is not cited in the bibliography.[61] Where 'cited', sometimes the titles of an individual 'lesson' are appropriated from within the corresponding episode entry of Danny Horn's otherwise supremely irrelevant (but highly entertaining) episode guide to the American 1960s supernatural soap opera *Dark Shadows*, *Dark Shadows Every Day* (Horn 2013).

A.1.2 'There's a Seeker Born Every Minute'—Madame Blavatsky Invents the New Age

It all starts with that remarkable person, Madame Helena Petrovna Blavatsky (1831–1891). Born in what is now the Ukraine, 'HPB' (as she later liked to be known) was a fractious child with early artistic talents and a predisposition to fantasising. Her family were minor aristocracy and were outraged when she rapidly deserted an elderly husband of equal rank whom she had impulsively married at the age of 17. She fled the country, and her whereabouts are obscure for decades afterwards (although Marion Meade's (1980) wryly absorbing biography offers research that fills in some of the gaps at least partly, and not always to Blavatsky's credit).

[61] As to the footnotes (here and throughout), 'Irish writers, with a long tradition of parodies of pedantry, often employ ['farcical mock-scholarly footnotes', which] are a reminder of the futility of epistemological readings of texts because the text is not locatable as an object of study—important information always exists outside the apparent boundaries of the text' (Booker 1995, p. 49, n. 6).

Figure 49: Blavatsky, pensive, in the last year of her enturbuled incarnation. (Original artwork incorporating Wegner (2012).)

By 1873, Blavatsky was in New York and calling herself a 'spirit medium'. She was cashing in on the Spiritualist craze that was fashionable in Europe and the United States at that time, and like many other 'mediums' at the time, she claimed to be 'possessed', inter alia, by 'John King', a sort of 'spirit-without-portfolio' who had been a Caribbean pirate in life, but now apparently divided his time between various rival 'trance mediums' over several decades, perhaps out of a sense of disinterestedness peculiar to those who have 'passed beyond'. At any rate, in 1874, while investigating reports of a 'levitating medium', Blavatsky met the lawyer and Spiritualist Henry Steele Olcott (1832–1907), and an unlikely but enduring partnership of opposites resulted. Her claims broadened, and 'John King' and his various associates were released from their contracts as Blavatsky and then Olcott ceased to define themselves as Spiritualists. One of the first fruits of their association was the foundation of the Theosophical Society in New York in 1875. This body, which rapidly became highly influential around the world (Gandhi attributed the birth of his national consciousness to Theosophical literature, and he met Blavatsky briefly in 1889), claimed to represent 'The Ancient Wisdom', which was the foundation of all subsequent religions. In the same year, Blavatsky published a book, *Isis Unveiled*, in which she declared Theosophy the source of the basic precepts of all science, religion and occult practices. The vertiginous volume of wonders 'went viral' in modern parlance, and it relieved her immediate financial embarrassments and made her an instant celebrity—a status that she clearly relished and did everything possible to further.

Blavatsky relocated to India in 1879, trailing the abstemious, mild-mannered and long-suffering Olcott in her wake as janitor for all of the turmoil which she invariably and irascibly generated around her wherever she went. However, her stay in India was comparatively short; she was accused of manufacturing the 'Mahatma Letters', which were written directives purportedly from the 'The Ascended Masters', whom she claimed were guiding her efforts to regenerate mankind from a secret invisible city in the Himalayan mountains. (She had supposedly resided and been trained for her mission in this place during her obscured early years.[62]) She returned to Europe in 1885, under a cloud and sans the belatedly chagrined Olcott, and divided her remaining time among the followers of Theosophy who had the largest reserves of both money and tolerance.[63]

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[62] This 'etheric city' was possibly an influence on the subsequent 'Shangri-La' myth of the 1930s and onwards. It should be noted that the concept of an immortal 'Ascended Master' is not of Blavatsky's creation but of subsequent authors, Theosophical and otherwise; Blavatsky referred to her alleged teachers as 'Mahatmas' or 'Masters' and claimed that they were mortal, but very long-lived and with supernatural powers. I have retained the later concept of the 'Ascended Master' throughout because it is now ubiquitous in these circles.

[63] 'She had a greater power over the weak and credulous, a greater capacity for making black appear white, a larger waist, a more voracious appetite, a more confirmed passion for tobacco, a more ceaseless and insatiable hatred for those whom she thought to be her enemies, a greater disrespect for *les convenances*, a worse temper, a greater command of bad language, and a greater contempt for the intelligence of her fellow-beings than I had ever supposed possible to be contained in one person. These, I suppose, must be reckoned as her vices, though whether a creature so indifferent to all ordinary standards of right and wrong can be held to have virtues or vices, I know not' (Mabel Collins, cited in Meade 1980, p. 391).

In increasingly poor health, Blavatsky published another book, *The Secret Doctrine*, in two volumes in 1888 and 1889. In these weighty tomes she expounded on the concept of the 'Root Races of Earth'.

A.1.3 Of 'Root Races' and Hyperborea

While in India, Blavatsky had made a convert out of the journalist A. P. Sinnett (1840–1921), causing Sinnett to believe that Blavatsky had placed him in contact with 'The Ascended Masters' via the 'Mahatma Letters', which were delivered by herself as proximate intermediary. These entities were not spirits of the dead, but rather immortal 'adepts' who had chosen Blavatsky as their conduit to the exoteric world beyond their invisible redoubt in the Himalayas, from which location they covertly directed the spiritual development of humanity, implicitly for the better. Under this heady influence, and no doubt aided by his own fecund imagination, Sinnett published the book *Esoteric Buddhism* in 1883. Immediately dismissed as absurd rubbish by many practising Buddhists of the day, the book claimed to be a direct psychic dictation to Sinnett by the Ascended Masters Koot Hoomi and Moruya (first introduced by Sinnett in his *The Occult World* of 1881). (However, these gentlemen regrettably seem to have failed to put in the customary appearance at the book launch, presumably due to their solemn vows of retreat from such worldliness.) Sinnett disclosed that Koot Hoomi had blue eyes and, although a supposed Brahmin Indian, 'is as fair in complexion as the average Englishman' (Leadbeater 1925, p. 43). However, he failed to mention the method, if any, by which the Ascended Masters' shares of the royalties for their co-authored books were forwarded to the astral plane.[64] (Perhaps they nobly renounced this sordid source of largesse.)

Figure 50: A 'psychically transmitted' portrait of the Ascended Master Koot Hoomi. (Original artwork, incorporating 'SERGEJ2011' (2011).)

At any rate, *Esoteric Buddhism* spoke of a series of ages in which the predecessors of humanity had lived on this and other planets. According to this theory, which appears to have been a direct challenge to both Christianity and the theory of evolution, the present human race is the fifth of seven that appear and disappear successively on every inhabited planet. This and similar revelations caused the book to be another immediate success, and its several editions either compelled or encouraged Blavatsky to incorporate the theory in her own final magnum opus five years later.

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[64] Sinnett, who seems to have been utterly impervious to even the mildest incredulity at this stage, recorded in *The Occult World* (p. 42) that in his very first 'Mahatma Letter' from Koot Hoomi (via Blavatsky), his previous suggestion—that these marvels could be placed beyond all possible doubt if the Masters materialised a copy of the day's issue of *The London Times* in India, to be confirmed when the more regular edition subsequently arrived from England by sea—was rejected 'precisely because [it] would close the mouths of the sceptics'. The world was apparently 'unprepared' for the result of 'the ignorant masses' hailing the revelation 'in the light of a miracle', and 'science would find itself unable, in its present state, to account for the wonders given in its name'. When Sinnett (or Koot Hoomi) was accused by an American Spiritualist of having plagiarised one of his lectures in *Esoteric Buddhism*, Sinnett placed an appendix in the next edition of *The Occult World* 'explaining' the cause of the misapprehension; Koot Hoomi had been psychically dictating a Mahatma Letter to Sinnett in Tibet to a young chela, or disciple, while exhausted by a long horse ride. The Master was not fully concentrating, and unconsciously regurgitated some 'detached sentences' that remained in his memory from an astral visit to the American Spiritualists at precisely the time when the lecture was being given. To make matters worse, the Master's young amanuensis muddied the waters still further by carelessly arranging the Master's dictation into a form that might have *appeared* plagiaristic (Sinnett 1888, pp. 87–93)...

Blavatsky—who may have taken an infusion of the fashionable 'scientific racism' of the reactionary French crackpot Joseph Arthur de Gobineau (1816–1882)—declared that humanity was progressively developing—*not* 'evolving'—through a series of 'Root Races'. She also proclaimed that the First Root Race, who lived at the present North Pole, were completely 'ethereal' and reproduced by fission. The Second Root Race—our present subject—she called the Hyperborean; they lived in the northern parts of Canada, Greenland, Iceland and similar places, and they reproduced by budding. The Third Root Race, the Lemurians, lived in the present-day Pacific and were mostly oviparous,[65] and (as noted in Section 2.4) their music has already been essayed. Each successive Root Race became less ethereal and more material, generally to their detriment. It was never clearly explained why divinity found this degeneration necessary.[66]

With a couple of exceptions, the Root Races were destroyed by successive cataclysms, leaving a kernel of divinely selected survivors who 'developed' into the next Root Race. The Fourth Root Race were the Atlanteans—and Blavatsky's riffing-on-Plato is the origin of the myths that have been so prolific in the present-day 'New Age' movement. The Atlanteans brought divine wrath and downfall upon themselves through acts of materialism, black magic and bestiality, and their continent sank, as had those of the Lemurians and the Hyperboreans before them. The Fifth Root Race, the Aryans, comprised most of present-day humanity except for those peoples for whom Blavatsky did not personally care, such as the Tasmanian Aboriginals, to whom Blavatsky attributed descent from degenerate Lemurians, and the Mongols, Malayans and American Indians, who were supposed to stem from scattered survivors of the degenerate Atlanteans (Blavatsky 2014, p. 195). (The extent to which Blavatsky can be held responsible for some of the warped thinking of subsequent German and Austrian occultist groups (such as the Thule–Gesellschaft) that fed into Nazism is still a controversial subject).[67]

The Sixth Root Race will eventually succeed present-day humanity as the result of a eugenic program to be undertaken by the Theosophical Society in the California of the twenty-eighth century, which will have become an island by then. The world will be powered by 'clean' nuclear technology and

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[65] Her emphasis on these reproductive details has been linked by some commentators with an imputed horrified fascination with sexuality, and Meade recorded the birth of a kyphotic child, Yuri, to Blavatsky in 1862 (Meade 1980, p. 87). The child, of extremely opaque parentage—Blavatsky passed him off as her 'ward' and went to the extent of obtaining an obstetric certificate 'proving' that she was congenitally incapable of sexual relations and childbirth—died in 1867, devastating Blavatsky, who returned from Italy to Russia with the body, principally to bury the boy in her homeland.

[66] Although it may have had something to do with de Gobineau's own straggle-brainedly patrician perception of the general decline of society, as evidenced by the fact that 'aristocrats' like himself were not, he felt, being treated with due respect by the hoi polloi following the French Revolution. The world largely owes the dubious blessing of the concept of the 'Aryan race' to de Gobineau's perverse 1853-1855 polemic, *L'essai sur l'inégalité des races humaines* (*Essay on the Inequality of the Human Races*), and as we have seen, Blavatsky herself was not wholly averse to the concept. (However, it should be noted that de Gobineau—who was secretly haunted by the fear that he was partly of African ancestry himself through slave-owning ancestors in Haiti—was not particularly anti-Semitic and in fact classified 'Jews' as Aryan. This was an aspect of his racial ideology that proved difficult for the Nazis to comfortably deplicate other than by judicious omission.)

[67] The question of Blavatsky's racism (in the contemporary sense) or otherwise remains highly contested. See Crow (2018) for a general examination of the issue. Santucci (2008) attempts to totally refute such claims on doctrinal grounds drawn from the writings of Blavatsky and Sinnett, and he explicitly denies any influence of de Gobineau on Blavatsky (p. 39), but in the course of making his argument he elides the really distressing things said by Blavatsky about, for instance, the Tasmanian and Australian Aborigines, some of which *supra*, and which as Bongiorno (2000) points out (p. 48 n. 52), can also be easily found in multiple locations in Volume II of *The Secret Doctrine*.

will be ruled by a Theosophical world government led by the reincarnation of Julius Caesar (Besant & Leadbeater 1947, p. 427). One can only wish him better luck this time.

A.1.4 To Laramidia!

> Who are you gonna believe, me or that dumb-ass 'fossil record'? Can your stupid goddamn 'fossil record' *prove it didn't happen?*
>
> Ascended Master Jāgand Mara, *Lessons*, Lesson 533: 'Just Shaddup an' *Listen*, Willya?'

Beyond Sinnett (and some obscure and uncredited 'occult' predecessors), Blavatsky's claimed authority for her theopneustics was the *Book of Dzyan*, an unspeakably ancient tālapattra or palm-leaf manuscript that had been burdened with the accumulated wisdom of pre-humanity via divine dictation somewhere in Central Asia at the beginning of the Fifth Root Race. Requests to Blavatsky to view the *Book of Dzyan* were curtly refused; it was a work so holy that its very covers must never be profaned by the cynical gaze of the doubter, or cosmical disasters would surely ensue. In any case, she added, looking into the *Book of Dzyan* would do no-one any good; it was written in the pre-human language of Senzar, presently unknown to anyone on Earth except her and the Ascended Masters. To this day, the *Book of Dzyan* remains mercifully uncontaminated by the slightest degree of contact with mundane humanity. Faced with such impeccable and self-referential authority, mere academic scepticism can only shrug eloquently.

Nevertheless, drawing such information as we can from the admittedly secondary sources of *The Secret Doctrine*, Sinnett's book—well, Sinnett, Hoomi and Moruya's book—and other equally inspiring Theosophical works touching on the subject, such as Arthur Powell's (1930) *The Solar System*, we arrive at the following general picture of the Laramidians:

1. They lived in the area of present-day North America.
2. The earth having not yet acquired its axial tilt, there were no seasons, and the climate was tropical.
3. They were hermaphroditic beings of 'semi-astral' nature but became more human-like over time.
4. Their consciousness was rudimentary, like that of a child or a dreamer.
5. They spent much of their time involved in religious and ceremonial activity.

Fortunately, another Ascended Master, Jāgand Mara, has emerged from the astral plane in recent years to provide some further detail on this subject. From his 'channelled' *Lessons* and supplementary information, we have learned something more about the ancient Laramidians and their views and ways.

Figure 51: Master Jāgand Mara (right). Original artwork, incorporating Clipart-library.com (n.d.) and Vandewalker (n.d.)

It would appear that Laramidian society was, generally speaking, somewhat more sophisticated than the Theosophists gave it credit for being. It is now known that it was entirely based on the supercontinent of Laramidia, which was a version of the North American continent that existed in the late Cretaceous period. This continent, thus named by palæontologists in 1996, consisted of three major land masses divided by a shallow inland sea; the islands of North and South Appalachia to the East and the single large land mass of Laramidia proper to the West. The Laramidians thus co-existed (and perished) with the dinosaurs, but of course since their own bodies were still mostly astral in nature, they left no fossilised remains worth speaking of. The widespread absence of remains of the Laramidians is in fact one of the strongest proofs we have of their existence, since the artefacts that they occasionally chose to make were made of quasi-ethereal materials, and of course these do not fossilise well, if at all.

The Laramidians originated from survivors of the First Root Race, the Polarians, who were driven to the subcontinent of South Appalachia after their own homeland was submerged. It is said by some commentators that hearing was a new sensation among them and, as such, of great importance. Much of their ritual and culture centred on sonic phenomena, and over time they acquired remarkable abilities in this area. Eventually they were able to mentally filter particular frequency bands out of ambient sound and reproduce the material with their own voices. It is perhaps unnecessary to add that their preferred mode of sonic discourse was what is today known as 'the BP scale'. This is therefore actually a rediscovery of a system of musical organisation that is so vastly ancient that it predates humanity itself. However, the theorists who articulated the scale in the late twentieth century cannot be held responsible for the misinterpretation, as they clearly lacked the crucial information supplied in this part of this document and could know no better.

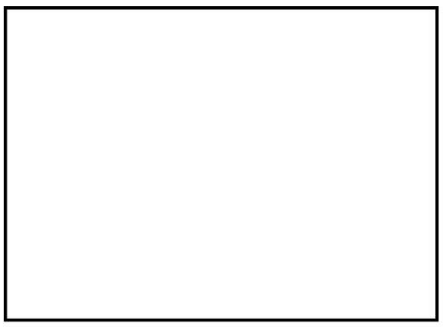


Figure 52: A fossilised Laramidian (detail of thorax).

A.1.5 In Pratiśruta Cave

In 1991, a duo of amateur archaeologists stumbled very much by accident on a cave high up on an isolated mesa in Goblin Valley State Park in Utah. 'Pratiśruta Cave', still not fully excavated, has proven to be a cornucopia of information about all aspects of Laramidian society, especially the late period. Much intriguing artwork was inscribed on the walls of the cave by means that are presently unknown. Although most of the images have naturally suffered some degree of degradation over the tens of millions of years since their creation, and the language accompanying some of the images is presently defying almost all attempts at deciphering, enough remains clear to establish that the cave was created as a repository for just this information at the end of the final phase of Laramidian society, just before the asteroidal impact that ended both the dinosaurs and the Laramidians was

foretold to appear. The archaeologists, who have thus far refused to make the exact location of the cave public beyond a couple of blurred and unhelpful photographs, have sporadically published their findings in a range of small journals ever since. Its location in Utah was on the coast of the main continent of Laramidia at the time, and it was apparently chosen as being one of the likeliest areas to survive the inundations and volcanism that spelled doom for the other parts of the continent.

Elaborate abstract drawings that have been reported by the excavators as 'decorative patterns' or 'ritual inscriptions' have been studied by metamusicologists associated with the Church of the SubGenius. They reported that these patterns are in fact sonograms—visual depictions of pieces of music throughout their frequency range and progress in time.

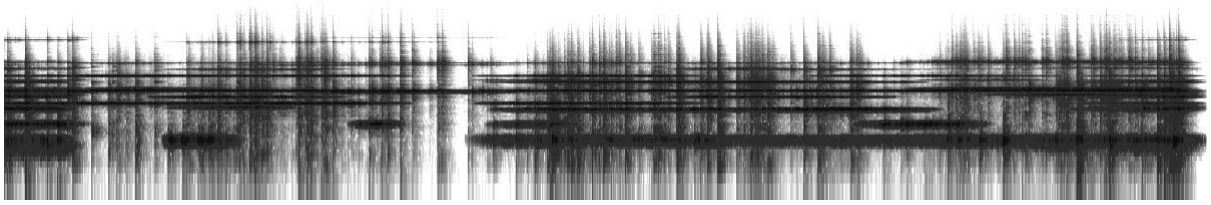


Figure 53: A sonogram from Pratiśruta Cave, corresponding to the track 'Mattavāraṇa' in the present work (see p. 68). Frequency rises from bottom to top. Time runs from left to right. Relative intensity of frequency is indicated by darkness.

From such sonograms, it is possible (with great effort) to work backwards to reconstruct at least an educated guess at the work of music that it signifies. One 'ArchD'Ikon Zibethicus Zenzizenzizenzic the Zetetic', who claims to represent the 'De Selby Institute of 'Pataphysics', has published a series of these sonograms in the *Journal of Sciosophic Pseudoethnomusicology* in recent years. These are the foundation of the tracks that are about to be described. Apparently the highly psychic Laramidians foresaw our present-day society and wished to warn us of the potentially desperate folly of trifling with novel tuning systems, precisely as Plato also warned in Book IV of *The Republic*.[68] Clearly, Plato was drawing on far more ancient (and now lost) sources to create a distant adumbration of the tragic decline and collapse of the Laramidians, whose ill-advised sonic restlessness ultimately led not only to their downfall, but to that of the dinosaurs as well. But more of this later.

By way of closing this section, we can only once again entertain a muted wonder at the kind of divine and omniscient providence that not only employs Madame Blavatsky for its annunciation of a New Age, but that also chooses to place critical musical information in a thoroughly disreputable 'vanity publication' like the *Journal of Sciosophic Pseudoethnomusicology*. These appear to be strange gestures on the part of the Universal Mind. However, as the American science fiction author Damon Knight wondered after studying the works of the 'anomalist' Charles Fort (1874–1932), if there is some sort of Universal Mind, is there any guarantee that it is actually sane?

[68] 'εἶδος γὰρ καινὸν μουσικῆς μεταβάλλειν εὐλαβητέον ὡς ἐν ὅλῳ κινδυνεύοντα: οὐδαμοῦ γὰρ κινοῦνται μουσικῆς τρόποι ἄνευ πολιτικῶν νόμων τῶν μεγίστων, ὥς φησί τε Δάμων καὶ ἐγὼ πείθομαι.' [424c].

APPENDIX A2: THE MUSIC OF LARAMIDIA

A2.1: The Laramidians, Their Ways and Means

We have noted that Laramidia was in the form of three island continents, as shown here. The Second Root Race started life on the comparatively benign South Appalachia (of course they had a different name for each of these islands) and rapidly flourished. The climatic conditions were in no respect any different from those associated with the area in the Late Cretaceous, and the flora and fauna were precisely as described in orthodox science. The Laramidians were largely as depicted in the Theosophical texts, with certain significant exceptions; generally they were spherical, translucent and golden-brown in colour, and they progressed in a sort of bouncing motion or flew when hurried, but their colours changed in line with their emotions, and when they chose to interact with the physical environment, they often adopted a blurry sort of bipedal form for convenience. At such times, they could create and wear ritual clothing, which might become quite elaborate, usually modelled on features of the dinosaurs around them.

Figure 54: 'Ein Shoggoth (nach Erol Otus)' ('A Shoggoth (after Erol Otus)'). Woodcut by Ernst Yollam (1897-194?) from the suppressed third volume of Von Juntz's Unaßprechlung Kulten, Unaßprechliche Kulte der Zukunft, *Vergoldeter Betrug-Verlag, Stuttgart 1928.*

As various witnesses have related, the sense of hearing was a new one for the Laramidians; they added this to the sight possessed by their predecessors, the Polarians. (Some say the new sense was touch and not hearing; at any rate, in view of the prevalence of dinosaurs, it is perhaps fortunate that they did not yet possess a sense of smell.) They had a form of vocalisation, but it was entirely restricted to the sounding of vowels, which were inflected with enormous varieties of meaning by the Laramidians at all stages of their culture, although the usages appear to have differed significantly over times and places. (This is still an area in the early stages of study.) Their music was of course based on what we now call the BP scale, but beyond this general description, it is difficult to pin anything down, as we are speaking of a non-human culture in a primordial state of semiconsciousness. Although it was present for some 80 million years, change was slow by human standards, at least until the late stages of existence on the island of Laramidia proper.

What little we presently know about actual instruments derives entirely from illustrations and other evidence preserved in Pratiśruta Cave. Sadly, these do not include any of the Laramidian instruments, but as electricity was apparently unknown to them as a practical device and the laws of physics have presumably not changed since, we can presume broadly that most instruments conceivable to the Laramidians would fall into the general classifications offered by the Hornbostel–Sachs classifications. Thus, they fashioned and used idiophones, membranophones, chordophones and aerophones of all different sorts. Illustrations suggest that some of these instruments would be in forms that would not be playable by a present-day human being, because although a Laramidian was capable of producing effectively any sound it could conceive of by mental means, the fashioning and use of physical instruments was regarded as a higher art, at least on the Appalachian islands. It is therefore not unreasonable to assume, unless otherwise noted, that the music mostly took an idiom not too much outside of the range we now think of as 'world music'.

In the detailed descriptions of the tracks that are to follow, that which is 'explained' relates to the 'esoteric' purpose and function of the track within Laramidian society, as deplicated by the Ascended Master Jāgand Mara via the admittedly equally dubious offices of ArchD'Ikon Zibethicus of the De Selby Institute of 'Pataphysics (whatever and wherever *that* may be!).[69] All of the provisos presented in the 'Discordian Disclaimer' should be applied here with redoubled enthusiasm. The titles of all of the works, except the last track, were assigned by Jāgand Mara in Sanskrit, which is, as everyone knows, the closest equivalent in the world today to the now-extinct Senzar used by *The Book of Dzyan* and the Laramidians themselves. If the usages make reputable Indologists squirm, I can only apologise on behalf of the sometimes-fuddled Ascended Master.

A2.2 The Music of Suloma (South Appalachia)

As noted, the music of the remotest period of Laramidian culture—the occupation of South Appalachia—represents probably the very origin of organised music on Earth (at least outside of possible animal musics of the Cretaceous and earlier times, regarding which nothing whatsoever is presently known). It is impossible to tell just when and how the basic organising information regarding the BP scale came to dominate Laramidian thought in South Appalachia; if there is some sort of origin myth, it does not appear to have been recorded, unless the first track presented here, 'Grāvā', is in fact that myth. Otherwise, BP is simply there from the outset. Given that even less evidence of Laramidian ear anatomy has survived compared with that of other species, we can only shrug and speculate.

The music of each Laramidian society was divided along what might be thought of today as 'class' lines or social strata. Most Laramidians were occupied with agrarian activities, and their music was considered straightforward and vigorous, akin to 'folk' music today. These forms generally stress comparatively simple beats and the use of percussive instruments. It appears that something like our present-day dancing was a great preoccupation of Laramidians, both in secular and sacred forms. The 'court' or 'art' music was more complex, abstract and sophisticated. Aristocratic or regal groups of Laramidians pursued these forms with great assiduity and passion, and the capability to appreciate, comment intelligently upon and occasionally participate in the production of these musics was regarded as one of the hallmarks of a true 'noble'. Sacred music was the exclusive province of the priests in South and North Appalachia. There was a strong preference for the creation of this music by entirely abstract mental means. On the Laramidian island proper, genres began to experience a degree of blurring that was the cause of much anxiety to conservative Laramidians; and since a Laramidian's lifespan could be numbered in millennia, conservatism was a rather common occurrence among them at all times.

The music of Suloma, known to us as South Appalachia, was usually equally tempered and might be considered rudimentary in form. Deviations from the standard 'Vathek' mode were rare. Melodies were simple in nature and tended to follow simple patterns. The examples that have been selected for this exercise have tended to be those that show early tendencies that were to be retained and elaborated upon by the two succeeding Laramidian cultures. The 'folk' pieces presented here are

[69] '**Esoteric**, *adj*. Very particularly abstruse and consummately occult. The ancient philosophies were of two kinds—*exoteric*, those that the philosophers themselves could partly understand, and *esoteric*, those that nobody could understand. It is the latter that have the most profoundly affected modern thought and found greatest acceptance in our time' (Bierce [1967] 1983, p. 113).

unabashedly simplistic in their form; they are, after all, some of the very earliest and most rudimentary forms of their kind. The Suloman tracks presented here encompass three folk pieces, two courtly and two sacred.

A2.2.1 'Grāvā'—Sulomian Folk (Track 1)

As stated above, this track possibly represents the very origin of Laramidian music, if not music itself. According to the associated artwork, this is either a psychic recording of, or a later ritual re-enactment of, the very moment when a nameless Laramidian, idly playing with a series of stones they had found on the banks of a stream, realised that they could be struck to create sounds in a certain sonic relation. The realisation of this possibility led to the idea that patterns of repetition could be created that elaborated on those relationships. Much Laramidian music—arguably much of *all* music—is an elaboration of that impulse. The voice at the end of the track is that of a dinosaur of the thyreophoran group, clearly pleased with the effect achieved. (The fact that this group's origins are currently placed in the early Jurassic period is possible evidence that this particular artwork was in fact a representation of a ritual recreation rather than the original event.)

The artwork asserts that the stones were not in that particularly precise sonic relationship by mere chance.

A2.2.2 'Madyhapatita'—Sulomian Folk (Track 2)

Jāgand Mara explained that the title of this piece has two connotations in the much-later language of Sanskrit; the word-stem 'madyapa' is generally translated as 'alcoholic drink' or 'drunkard'. In its form as an adjective as given in the title, the term can also mean 'falling or lying between' things, or in the middle of a thing. According to Jāgand Mara, the early Sulomians rapidly discovered the principle of fermentation from observation of natural examples, and the common folk soon discovered the basic principles underlying the creation of alcoholic drinks from fermented grain and seeds. (The recent discovery that flowering plants of the rice family may have originated as far back as the Triassic period, rather than the late Cretaceous period as previously thought, is another instance of science slowly catching up with our sacred, sweet mysteries, just as HPB predicted more than a century ago.)[70]

[70] Jāgand Mara has retained a fondness for spiritous liquors from his many Laramidian incarnations, and on some occasions when he manifests physically, partially or wholly, he has been known to 'smell like [he] just climbed out of a beer vat', to quote the 1947 film noir *Nightmare Alley* (1:45:17). At these times, his language is boastful and incoherent, and his temper distinguished by its truculence where it is not embarrassingly maudlin. He often goes missing for some days following such occasions. (Such manifestations are generally omitted from his recorded *Lessons* for fairly obvious reasons.) If held to account for such behaviour—so different to the sobriety and serenity displayed by the earlier Ascended Masters—Jāgand Mara simply snorts and invokes the 'authority' of Aleister Crowley, who refused to observe the prerequisites of eighteen months of chastity and teetotalling prior to the performance of the Ritual of Abramelin, on the grounds that 'these really amount to little more than injunctions to observe decency in the performance of so august an operation' (Crowley [1979] 1989, p. 173). Some 'occultists' have dated Crowley's 'decline' from the point at which he chose to disregard this injunction. Jāgand Mara's response to this proposition is entirely unprintable (Zibethicus).

Thus, this track is, in effect, a drinking song. It represents an extremely ancient folk ritual dance in which the participants hopped or bounced in and out of a line to the rhythm of the beat, sometimes emitting clapping or whistling sounds from temporary orifices formed for that purpose. Many such songs and rituals existed, despite everything the aristocratic and priestly castes of the Sulomians did to forbid them. The second meaning of 'falling between' refers to this dancing process, and possibly also to the aspects of the beat discussed below (now Part 3.2.2) by my colleague Mr Holmes.

A2.2.3 'Nagodara'—Sulomian Folk (Track 3)

This track is another drinking song; the Laramidians had a lot of them. It was recorded somewhat later and was intended to be played later at night, once things had progressed from the public ritual to private gatherings. The track is quite introspective for the place and time. The name means 'cleft in the mountains' or 'rift valley'. The cause of the association is presently unknown, but presumably geographic.

A2.2.4 'Krāntipātagati'—Sulomian Courtly (Track 4)

This piece was a sort of march or processional associated with a ceremony that was remarkable even by Laramidian standards. Needless to say, the Laramidian calendar ran along entirely different lines to ours and is yet to be fully deciphered. However, the fragments that have emerged so far suggest a preoccupation with extremely long periods of time, much more so even than the Mayas. Given the enormous natural lifespan of a Laramidian, this is perhaps unsurprising. The surprising part comes from the fact that this is the introductory march of a ritual celebrating the equinox—a phenomenon that Blavatsky insisted that the Laramidians could not have experienced. According to her inspired wisdom, the Earth only acquired its axial tilt as a result of the asteroid impact that destroyed Laramidia. Nevertheless, on a fixed date in their calendar that recurred at periods of well over a thousand years, the Laramidians would build a temple dedicated to the night sky and celebrate the precession of the equinox. This piece is the ceremonial march of a group of selected Laramidians who were costumed to represent celestial features of interest in their many rituals. They would march to this tune up to the great closed doors of the temple, which were abruptly flung open to admit them at the very end (the imperfect cadence of the ending was intended to build up the tension to this moment). The cave artwork does not record what happened after this point.

A2.2.5 'Mārgaśodhaka'—Sulomian Courtly (Track 5)

This piece, whose name translates to approximately 'avant-garde', is an interesting example of the rarefaction achieved by courtly music even in this early stage of the Laramidian cultures. Dating from perhaps the middle of the Sulomian period, this piece apparently has no specific purpose or intention beyond itself. The artwork associated with the piece (which is unfortunately too eroded for reproduction) depicts a group of courtiers listening avidly to the ensemble producing it. It appears that a particular emphasis was placed on the appreciation of the quartertones (as discussed below), which were an innovation of this period. The question of the particular application of BP quartertones was to assume much greater importance in later Laramidian musical culture.

A2.2.6 'Pavanamāyā'—Sulomian Sacred (Track 6)

This is an example of the mentally produced music of the priestly caste of the Sulomians. As the title, which is roughly translated as 'The Magick of the Wind', would suggest, the Sulomians were strongly influenced by the currents of the air around them, but where sacred music today requires the use of special instruments (or, in the case of performers like the Harmonic Choir of David Hykes, special training in overtone singing), the Sulomians were able to produce harmonics directly through mental means. The sonogram depicts one such event, which was largely improvised. It has no particular ritual purpose beyond the expression of thanks, generally, to the Supreme Being. Some temples had a special caste of priest–musicians who permanently maintained this 'psychic chanting'.

A2.2.7 'Mattavāraṇa'—Sulomian Sacred (Track 7)

This piece is at once an example of sacred and functional or 'utility' music. It is, in fact, a comparatively early instance of the remarkable ability of the Laramidians to mentally amplify selected frequencies of sonic energy already present in the soundscape for various purposes. In this case, the track—whose name means 'pinnacle' or 'turret'—was used by Sulomian priests in the construction of a temple. By amplifying selected sounds and suppressing others, they were able to boost selected frequencies to the point where, under proper conditions, large items such as blocks of stone could be levitated and easily moved considerable distances.

If this track proves incapable of replicating the feat today, we must first bear in mind that the atmospheric composition has changed considerably since the Cretaceous period, and, second, we are obviously not Laramidians. Perhaps, under the circumstances, nothing more could reasonably be expected.

A2.3 The Music of Sūrmi (North Appalachia)

Following a cataclysm that appears to have involved the outgrowth (or possibly induction) of widespread earthquakes and volcanism, South Appalachia was abandoned by the Laramidians, and there was a mass immigration to the then sparsely settled northern continent. In contrast to Blavatsky's claim that the earth had yet to acquire its axial tilt, and for reasons that remain unclear, North Appalachia appears to have had a much cooler microclimate; possibly the ongoing vulcanism in South Appalachia had a local cooling effect. Ice and auroras were the order of the epoch, and life became much more constrained than in the carefree southern days.

Fragmentary evidence suggests that there was a rebellion or overthrow of the existing order, which resulted its replacement by a new dynasty of aristocratic rule. Religious practice appeared to remain largely unchanged, but the culture (which was mostly expressed via music for the reasons mentioned above) saw significant developments. 'Folk' music was placed under centralised control and all forms were strictly regulated. A concern that is common to displaced or traumatised societies—namely, 'purity'—led to a musical philosophy that tended to strongly emphasise just over equal temperament. Artwork from this period features many depictions of divine wrath and natural disasters befalling those who were tempted to slip away from the 'pure tones' of small-integer ratios. It remains unclear whether these represent purported fact, prophecy or wish fulfillment. It should also be noted that a vehement insistence on just temperament—a property rather pragmatically

approached by the preceding culture—became part of this music, which seems rather puritanical to a contemporary gaze, even after exposure to Partch and the Pythagoreans.

Otherwise, the instruments and organising principles of the music did not appear to change significantly in this period. Almost all of the 'evolution' that occurred related to constraints in tonality. However, towards the end of this period, an 'innovation' was permitted to occur in the form of the gradual (and rather grudging) admission of quartertones into the music. Disputes over the exact form that these should take were a factor in a broader cultural dispute that resulted in a massive and devastating civil war in which enormous numbers of Laramidians destroyed each other by psychic means. (The Theosophical sources omit this period, presumably to protect the world from the devastating power of such weaponry.) The scattered survivors had rendered North Appalachia uninhabitable for themselves—although the dinosaurs and other flora and fauna went on much as usual, as they were not even partially present on the astral plane where these weapons were deployed—and they were forced to resort to the hitherto-taboo main island of Laramidia proper. Here they eventually formed a society, albeit much reduced in population size, which had a far more eclectic view of music. In fact, the new freedoms arguably proved *too* eclectic, but that is a story for another section …

The Sūrmian musics presented here are one folk piece, two courtly and two sacred.

A2.3.1 'Makṣikatoupan'—Sūrmian Folk (Track 8)

The mythology of the Laramidians was more elaborate than Blavatsky noted (or knew) in *The Secret Doctrine*. This short and rather sprightly fragment of dance is noted by late-period chroniclers with some disdain; according to those high-caste priests, it originates from the early period of settlement of Sūrmi, in which the scattered survivors of Suloma regrouped and settled wherever they were washed up on the shore. One of these groups held the previous priestly caste responsible for the calamities that had led to the destruction of the previous island; as a result, they contemptuously rejected organised religion altogether, replacing it with what would now be called deism.

They recognised the existence of a supreme being—to whom the group or tribe gave a Senzar name translating to 'Aiśadhikārin' in Sanskrit, which in turn roughly translates to 'The Supreme Bureaucrat'. They perceived the deity as being extremely distant from them and having no great interest in their affairs in either a positive or negative way, being mainly preoccupied with the enormous amount of detailed paperwork that always accompanies the micromanagement of a cosmos. This piece is the germ or kernel of a common ritual dance in this society to commemorate Aiśadhikārin's overthrow of Toupan, the creator of the previous cosmos, and his preparation for the next cycle of destruction and creation by imprisoning three magickal bees upon a cross of stone. The dancers were accompanied by a lithophone fashioned from fragments of the same material. This piece, in which dancers recreated the movements of the bees on a stone cross or a depiction of one, was intended to keep 'the bright bees of Toupan' in their appointed place.[71]

[71] For more details on this ceremony, its survival into the early Middle Ages of our own species, and the means by which the bees were finally (if briefly) liberated early in the twelfth century, and what ultimately came of all this, the interested reader is referred to Book Three of James Branch Cabell's novel *The Silver Stallion*; 'Toupan's Bright Bees' (Cabell [1926] 1983) (Zibethicus).

A2.3.2 'Dārudaśrava'—Sūrmian Courtly (Track 9)

This is a good example of the courtly music of this middle epoch of Laramidian society. The name approximately translates to 'the frog's ear', and the accompanying artwork suggests that the piece was intended on some level as a tribute to and/or depiction of frogs. These amphibians were widespread at this time and were often considered irresistibly funny by all castes and periods of Laramidians. The references in the artwork to what seemed to be an association between lightning and hearing in frogs was thought to relate to mating until the late 1990s, when it was shown that, unlike mammals, the initial auditory apparatus of the frog may be organised as much on an electrical basis as on a mechanical basis (Smotherman & Narins 1999). This is another striking instance of the slow pilgrimage through which science is slowly catching up with so-called 'mysticism'.

The portion presented here is an extract from a performance that continued for considerably longer. The low scraping sound that can be heard in the background is an imitation of the cry of a certain long-extinct species of giant frog—possibly a species from the genus now known as *Beelzebufo* or 'devil frog'—although fossils of these have only been found in present-day Madagascar. Jāgand Mara pointed out that the frog in question may have been mythological.

A2.3.3 'Tārakitadravaja'—Sūrmian Courtly (Track 10)

This long-form work is an instance of the extreme ossification of ritual music at the courts of the later dynasties of the Sūrmian rulers. The vehement reaction against popular musics, with their comparatively simple rhythmic and melodic forms, resulted in the court retreating from the outside world and enervating itself in rituals that became more and more elaborate over time, and were almost always accompanied by music. Naturally there was a call for more and more music to accompany these rituals, and so the capacity for extensive improvisation became an essential feature of the court musician, in the same way and to the same extent that the capacity to listen to seemingly endless amounts of this stuff in perfect stillness and with at least the appearance of rapt attention was a prerequisite for a career as a courtier or functionary.

Nevertheless, and perhaps surprisingly, the same essential melodic fragment as quoted in the Sulomian piece 'Krāntipātagiti' may also be found here, although as the rules of courtly procedure dictated, the fragment itself was never quoted directly. However, the foundational notes of the melody were never varied from either. It would seem from the accompanying artwork that this ritual was a competition between two orchestras, each sponsored by opposing courtly factions. The object of the ritual was to improvise for as long as possible without ever actually quoting the melodic fragment in its original form. If and when this happened, the whole orchestra would immediately fall silent in disgrace and shame, and then hand the field over to their opponents. The orchestra that kept this up for the longest time and with the greatest skill would be judged to have 'won' the tournament, giving the sponsoring faction considerable prestige and power.

The animal cries that punctuate this piece at irregular intervals originate from a juvenile dinosaur of an unknown carnivorous theropod species that apparently wandered into the performance by mistake and could not find its way out of the hall again. As the rules of the ritual strictly forbade any sort of movement not directly related to the performance of the music, the animal could not be removed until it eventually found its own way back out, after attempting to bite several musicians

(the animal's jaws passed harmlessly through the part-ethereal Laramidians). It seems that later archivists found this amusing and recorded the event for posterity.

A2.3.4 'Antarhāsa'—Sūrmian Sacred (Track 11)

This track is an instance of the totally abstract and mentally created sacred music of the Laramidians. Previously, combinations of instruments had been employed in courtly ritual music that sometimes carried over into the sacerdotal forms, but in the much more stratified society of Sūrmi, there appears to have been an operating assumption that the priestly caste was the only one capable of creating mental music. This piece is an exercise in such tone production, in a stable key overall and, since it dates from an early stage of Sūrmian society, it does not have the quartertones that subsequently fuelled the tragic civil war, which led to the decline and fall of the northern island's society. It is therefore perhaps all the more incongruous that the title of this piece translates to 'bubbling over with suppressed laughter'. When asked to clarify this etymology, all that Jāgand Mara was willing to offer was his own characteristic baritone chuckle and the obnubilous assurance that 'you'll find out eventually…'

A2.3.5 'Parṇavādya'—Sūrmian Sacred (Track 12)

A late-period sacred piece, this track is a practical expression of the ongoing fascination that the Laramidians had for the relation between the natural environment—particularly the effect of wind and air currents—and their arts. The title of this piece translates to 'music produced by blowing into a leaf', and Jāgand Mara suggested that this may be programmatic and/or descriptive on some level. Beyond this, little is definitively known about this piece, although the impression of melancholy suggests that it may have been a foreshadowing or even prophecy of the coming dissolution of the Sūrmian society, like a dried and desiccated leaf at the mercy of the caprices of the breeze.

A2.4 The Music of Praśāsitṛ (The Island of Laramidia)

And so, somewhen in the Middle Campanian Era of the Cretaceous epoch, Laramidian culture relocated in toto to the eponymous island, which they knew as Praśāsitṛ (the 'Master' or 'Dictator' island, and which had been taboo for Laramidians to this point). This was clearly a time of great ferment and development by the admittedly slow-moving standards of the Laramidians. All social forms were subjected to considerable flux, and their experimentation did not end there; they were naturally skilled at psychic engineering of genetic material, and it is no coincidence that the so-called 'Campanian Explosion' saw a tenfold increase in the numbers of known dinosaur genera in precisely this area at precisely this time.

As with the other two phases of Laramidian culture, music was still predominant, but a much greater variety of forms and styles were permissible. Almost everything that could be experimented with was, along with an enormous variety of social forms that came and went—most of them at least initially more similar to sophisticated hunter–gatherer organisations than the former heavily stratified hierarchies that characterised North Appalachia. There was a concomitant blurring of musical boundaries, in which elements that had previously characterised the different forms were increasingly found across now-permeable boundaries. The instruments became much more sophisticated and elaborate, but one of the characteristic aspects of Laramidian music in this phase is that the role of mental performances became much more significant.

There was also a great variety of experimentation with the forms of the music. The quartertones that apparently brought about the downfall of North Appalachian culture were nevertheless retained and even augmented in a variety of ways. Basic tuning was varied in ways that had never been permissible before. The Vathek modes were supplemented with modes that moved the characteristic three-tone step to various places. Other modes altogether were experimented with; some were reminiscent of van Prooijen's approach. Finally, an extreme radical suggested that it was possible to conceive of a hitherto-unknown scale that lay 'alongside' the BP scale, consisting of 12 notes that repeated in the space of an interval that was only double that of the frequency of the starting note…

A2.4.1 'Nakṣatravinoda'—Praśāsitran Popular (Track 13)

The enigmatic chroniclers of Pratiśutra Cave become uncharacteristically reticent and melancholic when describing this track, although they dutifully left enough of a sonogram to make a reasonable stab at a reconstruction (assuming that they are telling the truth about it). Even Jāgand Mara was disinclined to discuss this track at any great length beyond observations like 'well, I guess it *had* to happen…' (Lesson 563, 'Men Are Made of Meat', 57:00).

The etymology of the title of this track is something like 'Bored of the Stars' or 'Mocking the Stars'. It appears that in the ferment of developing cultures on early Prāśasitṛ, a sort of cult arose among the 'younger' Laramidians (although of course this could only be a very relative term). It involved a total rejection of the intricate stellar worship of the priestly classes, which had slowly developed over the course of millions of our years during the previous two Laramidian societies. The artwork accompanying this sonogram—unusually detailed and profuse—shows the anguish of the priestly chroniclers over what they clearly regarded as the perverse rejection of immutable, eternal and self-evident truths.

Not only did these 'youngsters' in the 'Bhīmasaraṭa' cult reject stellar worship, but they also rejected the concept of 'development' altogether and venerated the dinosaurs around them, at first covertly and then increasingly openly. The cult averred that these mindless creatures were happier and healthier than the Laramidians, and they pointed to the largely untroubled survival of these species throughout the catastrophes that the Laramidians seemed unable to stop bringing upon themselves, despite or perhaps because of their sophistication.

The 'Bhīmasaraṭans' adopted strange styles of dressing and secret jargon. Increasing pressure from outraged local authorities forced them partly back underground, but their music flourished in secret 'youth' clubs. In response to the destruction of their instruments and the prohibition of performances, cult members who had budded off from priestly Laramidians were eventually able to train their fellows in the performance of the totally mental music that had previously been the exclusive privilege of the priests—interpreted in a drastically different manner, of course. This flouting of the most sacred restrictions did not go unnoticed or unpunished for long, and when those in authority realised that the musical style of the Bhīmasaraṭans was partly based on distortions and deliberate and strenuously blasphemous parodies of their own sacred music, they were driven to act. Their revenge was terrible—so much so that most references to it were suppressed for millions of years afterwards. The Prāśasitṛian priests who preserved the sonograms right at the end of the entire Laramidian culture regarded this rebellion, despite its apparently successful and total suppression, as at least partly to blame for their downfall, and so they passed this piece along as a closely kept secret,

with many graphic warnings as to its terrible potential if ever sounded again. This is *probably* unlikely to apply to the sounding of the music today given the different atmospheric conditions and performance by and to a different species, so I have instructed my colleague Mr Holmes to attempt as accurate a reconstruction as possible. No doubt he will shortly explain the details in his usual prolix and pompous manner (see 3.2.13).

As to the suppressed Bhīmasaraṭans, Jāganda Mara related that their fate was truly terrible. As a punishment for mocking the form of the Second Root Race—many were captured in the throes of trying to permanently transform themselves into dinosaurs—they were deprived of the privilege of retaining a stable form at all, and as both a penalty for mocking divine foresight and a wise precautionary measure, the rebels were also deprived of much of their memory and reasoning capacities. In this reduced form, as little more than seething masses of partly etheric protoplasm forming and unforming temporary organs, they were sold as slaves to the alien race known as the Jyeṣṭhatama that had recently arrived from the stars to settle in huge cities in Australia and Antarctica. This was done because, as Jāgand Mara put it with his usual diplomacy, 'Why Australia? 'Cos that's fuckin' *worse* than *death*, man! *Everybody* knows *that*! Ask a fuckin' *Limey*, asshole; *they did it too*!!'[72] (Lesson 522: 'Brother from Another World', 5:19).

Eventually the enslaved Bhīmasaraṭans unexpectedly regained some of their sentience and overthrew and destroyed their masters, but when the American fantasy author H. P. Lovecraft (1890–1937) came to tell the story in his 1936 novella 'At the Mountains of Madness', his sources were incomplete, and he never knew the *full* horror behind the origins of his 'certain multicellular protoplasmic masses capable of molding their tissues into all sorts of temporary organs under hypnotic influence', or 'shoggoths', as they were called (Lovecraft [1966] 1985, p. 85). Now the truth can finally be told.

A2.4.2 'Vyālamṛganṛtya'—Praśāsitran Popular (Track 14)

The artwork accompanying this sonogram is full of illustrations of pious horror and despair. The august chroniclers of Pratiśruta Cave explained that it is an example of the popular music of the Bhīmasaraṭan cult and is 'popular' in the sense that it is not in itself a deliberately twisted parody of mainstream sacred music, but rather the sort of music played in the underground clubs of the cult for dancing and ritual purposes. The title of the track roughly translates to 'Dance of the Fierce Predator', and it appears that it was a programmatic depiction of an incident in the life of a tyrannosaurid, and that the participants danced the story in question.

The animal roars its hunger fiercely as it stomps about the landscape, searching for its prey. Picking up a scent, it rushes out from ambush and seizes on the victim. Horn-like instruments depict the dying shrieks of the tyrannosaurid's latest meal, and the fierce growls and roars of the predator continue throughout the carnage. Although the inscriptions associated with the sonogram and artwork remain to be translated, the artwork leaves little doubt that the priests who reluctantly

[72] This sentiment was shared by Madame Blavatsky; when she prematurely feared she was about to be exposed as a fraud in New York in 1876, she lamented that 'there is nothing left but to start for Australia and change my name forever' (Meade 1980, p. 165).

recorded the piece regarded its sonic organisation as deliberately crude and repetitive to the point of studied obnoxity. There was also a distinct element of moral panic in the presentation of the 'crude' and 'primitive' 4/4 beat; the artwork makes it quite clear that the priestly chroniclers regarded this music as 'animalistic' and thoroughly decadent and morbid, and at least directly contributory to the process of theriomorphosis, which they regarded as the greatest sin of the Bhīmasaraṭans. They also ascribed to this sort of music a major role in the ultimate development of the 'new' 12-tone-to-the-octave system, which ultimately caused the doom of both the dinosaurs and the Laramidians.

A2.4.3 'Vṛkatātviśvavidyālaya'—Praśāsitran Courtly (Track 15)

This rather long track appears to have been perceived by its chroniclers as the apex of the always-elaborate courtly music of the Laramidians. Here, in the last stages of the Praśāsitran courts, the mentally produced sacred music of the priests was permitted to intermingle with secular sounds, both mental and instrumental. The melancholy sound that characterises this piece is characteristic of the enervated atmosphere of the final years of the aristocracy, whose informants, the priest–astronomers, were well aware that the final catastrophe was impending, but were unable to do anything to prevent it. Fatalism and meditations upon 'destiny' were the flavour of the times, and some nostalgia for the supposedly 'simpler' and 'purer' times on the other islands was expressed.

However, the Praśāsitrans largely accepted their preordained fate with equanimity and the knowledge that only by these means was it possible for the necessary progression through the Root Races to continue. Therefore, in the final analysis, this is music of radical acceptance or resignation, but tinged with a certain wistfulness. The four stages of development of the music, explained by Mr Holmes below, were considered symbolic of the cosmos itself, as well as the four seasons that the Praśāsitrans knew were soon to come upon the Earth as a result of the asteroidal impact. It is touching to realise that, despite their knowledge of their own imminent dissolution, the Laramidians never lost their concern with, or faith in, the Great Cycle of Being.

A2.4.4 'Tatpara'—Praśāsitran Sacred (Track 16)

Although Blavatsky claimed—contrary to so-called modern 'science'—that at this stage the Earth had not yet acquired its own axial tilt, the Laramidians, who were keen observers of the heavens, took a great interest in the doings of the planet Jupiter, for which they felt much sympathy for various reasons (much as, later, Sun Ra would claim to be a native of Saturn). Whatever the state of the Earth's tilt or otherwise at this time, the Laramidians had not failed to note the apsidal precession of Jupiter's orbit, which, then as now, had a period of some 180,000 years. This was well within the lifetime of an individual Laramidian under favourable circumstances, and this piece is an extract from a far longer performance of the usual stately kind, which the Prāśasitṛians at the various temples would all perform to celebrate Jupiter's return to its original orbital period at an arbitrary point set at the start of Laramidian culture on the island of Suloma. (This apparently also marked the point of return for one of their extremely elaborate calendrical systems.) The piece is particularly noteworthy for the accompaniment of the mental 'instruments' by a chorus of specially trained priest–singers who claimed to be 'speaking the voice' of the planet.

As to the survival of this melody (see 3.2.16) beyond the span of their species and into our own—if that is what really occurred—again, only conjecture is possible. One possible route of preservation

was via the Ancient Greeks (as we have seen, Plato clearly knew something of the lost Laramidia, as well as Atlantis), and thence into Byzantine sources. These, in turn, possibly led to an Arabic or Persian transmission via Morocco into Arab Andalusia, and from there by an easy diffusion into the eleventh-century beginnings of the troubadour tradition in Occitania. The trail from the Languedoc to 'pastoral' France a few centuries later is the least speculative part of the process.

However, another possibility was hinted at by the Sanskrit title assigned to this piece by the Ascended Master Jāgand Mara. The word 'tatpara' means 'rapidly' or 'in the twinkling of an eye'. This is presumably intended as some of his characteristic irony, given the stately nature of the piece and its slow evolution, as well as preserving the stellar theme common to all of the titles of these three pieces, and further given the word's applicability to the phenomenon of astronomic scintillation. However, the word has another meaning, which corresponds approximately to 'eagerness', 'single-minded devotion' or 'a noble purpose'. And when used as a word-stem, other meanings become possible. One of them is the term 'tatparatva'. This has the double meaning of 'inferior to' or 'following behind' in the temporal sense. But which piece is 'following behind' the other? Did the Laramidians finally acquire the ability to see forward in time beyond their own demise and into our own epoch, to reverse-appropriate a simple melody from another time and place that they found appealing? It is fitting to prepare to close this section with a phrase that can be found in various forms in the types of media that covered 'unsolved mysteries' of this nature in the 1970s, often solemnly intoned by Leonard Nimoy or Rod Serling: 'We may never know for certain'.

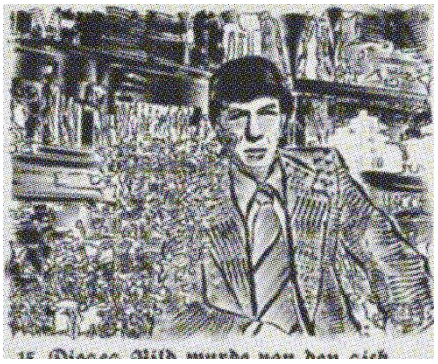


Figure 55: Wir Werden es Vielleicht Nie Genau Wissen' ('We May Never Know for Certain'). Woodcut by Ernst Yellam (1897-194?) from the suppressed third volume of Von Juntz's Unaßprechlung Kulten, Unaßprechliche Kulte der Zukunft, *Vergoldeter Betrug-Verlag, Stuttgart 1928. Displayed at the 'Degenerate Book Illustrations' exhibit, Mannheim, 1938. Original woodblock believed destroyed on personal order of Göring, ca. 1942.*

A2.4.5 'Kṛtrimakeśāvartī'—Praśāsitran Decadent (Track 17)

This track has an unusual history, particularly in that it significantly predates the other material presented here. In the mid-1960s in America, 'Evil' Edward P. Lovelorn, a Sanskrit scholar, electrical engineer and extreme-Right crackpot (1908–1994), was forced out of a teaching position in an obscure Midwestern college due to, he claimed, Communist subversion in the dean's office. (The college—which I will not name—countered that Dr Lovelorn's repudiation of the John Birch Society in the early 1960s on the grounds of what he viewed as their 'socialist' nature was acceptable, but that his increasingly public Holocaust denial was too much for them to tolerate.) Lovelorn was lucky (and 'grateful' by his standards) to be offered a less remunerative and still more obscure position as a lecturer in the Electrical and Automotive Trades School of the small Technical College in Prod, Utah.

His official duties were light, and Lovelorn, also an amateur archaeologist with some controversial views in that area as well, spent his spare time searching for the skeletal remains of what he firmly believed to be a now-extinct race of polydactylic 'giants' that predated present-day humanity. (Somehow, Lovelorn had convinced himself on 'Vedic' grounds that these monster humans were

both 'Caucasian' and the true original founders of the Fifth Root Race.) Needless to say, he never found anything that would convince anyone else, but his diggings and his outspoken political views caused some publicity to spread in the Utah media.

One day in 1967, Lovelorn arrived at his office to find that a small, flat parcel had been pushed under his door, apparently sometime during the night. It contained an acetate disc of unknown origin and nothing else. The parcel was addressed to Lovelorn with a typewritten label and had no return address. The 10" acetate (or more correctly lacquer) disc was of a type common in recording studios at the time, being a thin circular sheet of aluminium coated with nitrocellulose lacquer. Such discs were used to create instantaneous recordings in novelty stores and funfairs, or to rapidly create a playable test recording of a music session for a musician or other customer who had access to a record player but not a (then-expensive) reel-to-reel tape recorder. It had only been recorded on one side.

The label of the (untraceable) disc was blank except for the word 'Kṛtrimakeśāvartī' handwritten in Sanskrit (कृत्रिमकेशावर्ती). Lovelorn immediately understood that this was a portmanteau word derived from the terms for 'wig' or 'toupee' and 'suppository'. As Lovelorn wore a wig himself, he concluded that the recording was most likely to be some more of the abuse that he was used to receiving in copious quantities after each of his media appearances. Still, being intrigued by the prospect of being possibly invited in Classical Sanskrit to insert his wig in a certain fundamental orifice (and mindful of the fact that he had at least as many scholastic enemies as the other kinds), he obtained a portable record player from the college library, played the disc and heard this track for the first time.

Lovelorn, a keen amateur cellist who was also professionally aware of the current progress in electronic synthesis, was taken aback by the music in more than one way. It seemed familiar and yet extremely distant, and there was something about it that he could not quite place tonally. None of the instruments being used seemed quite like those he was familiar with, such as the Ondes Martenot, the theremin, the Hammond Novachord and the electric organ.[73] He played the record over and over and made whatever enquiries he could about its origin, but none of the local recording studios would admit to having anything to do with the disc's production, and he gave up pursuing the matter after advertisements in local newspapers asking for the creator or creators to come forward proved fruitless. (Lovelorn dismissed the idea that he was being pranked by some of his students, due to his Olympian contempt for Utahans, electricians and students as joint and several categories of humanity.)

By the early 1970s, Lovelorn had formed a tentative hypothesis that the music was a heavily synthesised interpretation of the lost ritual music of the so-called 'Fremont Culture'—a group of pre-Columbian Puebloid Indians, now vanished, who occupied most of Utah (including present-day Prod) until perhaps the tenth century CE. Lovelorn was intrigued by the claim of his informants

[73] Lovelorn was naturally aware that Don Buchla had begun to market his Buchla Modular Electronic Music System in 1965, and he had seen and tinkered with Robert Moog's prototype synthesiser at the Audio Engineering Society meeting in New York in October 1964, but he was dismissive of the potential of both systems, and in any case, the recording did not sound to him as though it could have been created by either instrument. This mystery baffled him, and he could not account for it until the advent of the fully digital Yamaha DX-7 in 1983, after which Lovelorn scrawled a note on one of his rejected articles declaring that the music from 1967 strongly resembled the 'new' digital sounds. He could never account for this similitude, but he had also largely moved on to other interests by this time, and the note remained a note (Zibethicus).

among the Navajo that the enigmatic Fremont people had possessed and preserved arcane knowledge from before the Great Flood, which he believed had probably destroyed the 'giants', but all of his submissions to archaeological journals on the subject were summarily rejected, and he never guessed at the full truth.

After the terminally ill Lovelorn committed suicide at an advanced age in 1994, a recording of the now rather worn acetate disc, which had languished in his archives for decades, came into the possession of the De Selby Institute of 'Pataphysics via contacts in the Church of the SubGenius (which retains the original at Lovelorn's perhaps sardonic bequest). It is perfectly clear, from the sonogram and from the recording itself, that what we have here is a transcription of music from the final, and in fact terminal, state of Laramidian culture—the period just before the end, when recognisably BP music became mixed with 12–ET experiments. An attentive listener will hear faint strains of the track 'Krāntipātagati', along with another BP track not presented in this project, in what appears to be an ironically intended 'collage' form. Jāgand Mara reported that this represents some of the last music recorded in the Laramidian culture; specifically, a very late stage in which the two nominally opposing strains of Prāśasitṛan music became integrated into a sophisticated amalgam of the 'sacred' and the 'secular'. Together with this process, which involved ironic if affectionate quotations of beloved old works like 'Krāntipātagati', the 'new' 12–ET music exerted such an irresistible pull on the novelty-minded that music using both of the scaling systems simultaneously was attempted, as in the case at hand. You may be listening to the very music that brought about the coming of the fatal asteroid … but as to who produced the acetate in the first place, as well as how, when and where it was done and how and why it was placed in Lovelorn's office, we have no idea whatsoever, and Jāgand Mara steadfastly refused to elucidate, merely repeating variations on 'it is not for you to know'.[74]

Perhaps it was a typically puerile student prank, similar to the one said to have been played on Professor Johann Beringer by his students in the eighteenth century.[75] But if it was a prank, then the resources required to produce it were considerable, and the hypothesis fails to account for the clear presence of BP music on the disc several years before its articulation by Bohlen. Only one piece of puzzling evidence since then has offered even an indirect clue. In Trent Harris's 'cult' movie from 1991, *Rubin and Ed* (made and set in Utah), one of the two lead characters, exasperated with the other, throws handfuls of breakfast cereal at him and instructs his antagonist to 'RUB IT IN YOUR HAIR AND STICK IT UP YOUR BUTT!' (*Rubin and Ed* 1991, c. 19:50). Jāgand Mara suggested that the otherwise-absurd conjunction of the reference to hair and the rectal insertion of found

[74] He has, however, recently dropped some guarded and very oblique hints that the obscure 1960 'concept album' by the 'eccentric' British pop producer Joe Meek (1929–1967), *I Hear a New World*, may have been at least an 'influence'. Meek believed the Moon to be inhabited by several different intelligent alien species and depicted them in music (Zibethicus).
[75] Beringer (1667–1740) was Dean of the Faculty of Medicine at the University of Würzburg. His interest in 'orytics', or objects dug from the earth, was an early instance of palaeontology. Beringer paid boys to bring him 'interesting' stones, and he was delighted when images of whole, complete animals and even Hebrew writing began to appear on limestone specimens which he bought. Dismissing warnings that the soft limestone bore obvious chisel marks, Beringer rushed to print a book describing his 'findings', *Lithographiæ Wirceburgensis*, in 1726. Once the book was released, Beringer was presented with a stone which bore his own name (or was wised up by other means according to different accounts), and he thereafter expended considerable energy and funds trying to buy up and destroy all the copies of his book that he could find. The affair has entered mythology as a particularly cruel student prank, but surviving records suggest that Beringer was in fact the victim of a particularly cruel *academic* prank by two jealous 'colleagues'. The reputations of these men were also ruined when Beringer successfully sued them (Boese 2015). The first edition of Beringer's book, which ironically entered a second printing in 1767 after his death, is now a rare collectable (Zibethicus).

objects in the same sentence should not necessarily be regarded as merely an amusing coincidence, particularly in view of the fact that part of the movie's action takes place in Goblin Valley State Park, Utah, the very location of Pratiśruta Cave and therefore all of the sonograms on which this project is based, except for this one, which was necessarily sourced from a recording of the rare and valuable acetate.[76] Perhaps the Sanskrit title of this track was a snide invitation by either the Laramidians themselves or the nameless recreators of the music in the 1960s (or both), and perhaps less to the immediate recipient than to posteriority in general, to 'rub it in your hair and stuck it up your butt'.

A2.5 How the End Finally Came to Laramidia

> Here the Mock Turtle yawned and shut his eyes. 'Tell her about the reason and all that,' he said to the Gryphon. 'The reason is,' said the Gryphon, 'that they *would* go with the lobsters to the dance. So they got thrown out to sea. So they had to fall a long way. So they got their tails fast in their mouths. So they couldn't get them out again. That's all.' 'Thank you,' said Alice. 'It's very interesting.'
>
> *Alice's Adventures in Wonderland*

The circumstances that led to the final downfall of Laramidia are intimately connected with its music, as has been hinted at before. The Prāśasitṛian culture had been deeply affected by the Bhīmasaraṭan cult, much as it might deny the fact in its official documentation. There is, in fact, a series of illustrations in the later and only partly excavated portions of Pratiśruta Cave that have been provisionally interpreted as the personal and quite unauthorised opinions of one particular individual, who may have been offering a dissenting opinion from the official version of events that they were supposed to be recording, in much the same manner as the Byzantine historian Procopius of Caesarea (c. 500 CE–c. 570 CE) secretly produced in his *Anecdota*, better known as *The Secret History*, a scathing alternative account of the imperium he was otherwise paid to extol.

According to this perspective, the 'underground' music of the Bhīmasaraṭans slowly infused the mainstream culture and caused certain notes to be 'bent' in the same manner as the blues affected American popular music. This process, together with a certain anxiety about quartertones that carried over from the previous culture of Sūrmi, led to a degree of flexibility in interpretations of the scale, as has been demonstrated in our coverage of Prāśasitṛian music. This flexibility was pushed to its boundaries and finally beyond, when, as mentioned earlier, a radical reformer postulated a new 12-note scale based on a repeating interval of twice, not thrice, the starting frequency.

This new system caught on rapidly in all areas of Prāśasitṛian cultures. Conservatives fumed as strange new melodies and instruments were heard for the first time. They warned—in terms echoed much later by Plato in Book IV of *The Republic*—that musical innovation might well prove fatal to the state. Unlike Plato, however, the priests felt that the entire cosmic order was threatened by these alien sounds. And they were right.

The standing wave and associated harmonics (or modes, or partials) in the space between the Earth and the ionosphere, known as the Schumann resonances, existed at this time as they exist today, but

[76] It is also notable in this context that both of the main characters in the movie wear very obvious wigs throughout (Zibethicus).

at a different range of extremely low frequencies that were in the BP scale at this time. They had been able to tolerate the variations of that scale that characterised the late Prāśasitṛian music, although not without an increase in lightning and volcanic activity (evidence of which survives today in the Deccan Traps of India). However, a complete change in musical systems was quite premature and caused the whole planet to be in effect 'out of tune'. The inharmonic vibrations propagated into deep space and eventually knocked a certain asteroid off course…

Appendix A3:
ON OBSTACLES TO COMPLETION

> „To je vidět podle protokolu, který jste podepsal," neméně laskavým tónem řekl soudní rada, „nedělali na vás nějaký nátlak na policii?" „Ale kdepak, vašnosti. Já sám jsem se jich optal, jestli to mám podepsat, a když řekli, abych to podepsal, tak jsem jich uposlechl. Přece se nebudu prát s nimi kvůli mýmu vlastnímu podpisu."
>
> Jaroslav Hašek, *Osudy dobrého vojáka Švejka za světové války*

> Oh, life is a glorious cycle of song,
> A medley of extemporanea;
> And love is a thing that can never go wrong;
> And I am Marie of Roumania.
>
> Dorothy Parker, 'Comment'

The handbook for the UTS Doctor of Creative Arts program (University of Technology 2018) stipulates that a report on obstacles to the completion of the study program is a requisite component of the written exegesis. This places me in a difficult position, as there were no obstacles to report on at all fnord. The entire course of study has undoubtably been the happiest time of my life. Everything flowed as smoothly as conceivably imaginable: it was almost dreamlike. The support I was offered by all my supervisors could not possibly be faulted. Each successive review of progress was completed in a timely and efficient manner. Feedback was given promptly, objectively, and in comprehensive detail. The processes involved were always laid out with the utmost clarity and consistency.

The promised personal development was offered to me in such intarissable abundance that the hours spent on marking undergraduate assignments and taking classes and so forth eventually became a serious drain upon my time. The financial reward, however, along with other financial support, was so generous as to leave me with a feeling of slight embarrassment at being able to pursue my studies in such ease and even luxuriance. My colleagues in the School, however, were always ready to assure me that this was nothing more than my just due. Their support could not have been warmer or more sincere, and their reception of me as an equal in their ranks was such as to leave me melancholy at the prospect of having to leave such devoted and mutually respectful friendships behind. If anything, they are more chagrined than I am that only the current near-total collapse of the higher education system (which may shortly also claim their own hides) prevents them from offering me a permanent position amongst them. I am unworthy of such a signal honour in any case.

I strongly advise any creative artist who may be contemplating a Doctor of Creative Arts program to embark upon it with the utmost enthusiasm and without delay. It cannot possibly fail to vastly enhance their creative practice, their career prospects and their general delight in their purpose and destiny in any and every way imaginable. I experienced no untoward interference with my creative program whatsoever. At no time was I ever prevented or even discouraged from saying exactly what I wanted to say. I was not, for example, obliged to 'revise' this statement, *which I am absolutely*

required to include in this document, five times. On the contrary; any slight delays in the program which did occur were solely my own responsibility, in consequence of my wayward stubbornness and inexplicable and thoroughly perverse nonconformity. I deeply regret the pain and difficulty which this has caused to my superiors. Indeed, I cannot emphasise sufficiently that nonconformism can only be destructive and possibly eventually fatal to the pursuit of the creative arts in any environment and particularly the academic environment. While this should of course have been self-evident, it took great and persistent efforts on the part of UTS to hammer the message home so hard and so often that it finally took up permanent residency in my thick skull. I thank everyone in sight for the lesson, which I will certainly never forget now for as long as I live. *Quod nocet, saepe docet*.

Needless to say, the process of examination of the doctoral materials was swift, efficient and objective and fair in the highest standards of the profession. Any minor changes in the form of the exegesis which have resulted from that process were the unanimous decision of the examiners and were very gladly made by me, as they have added almost unthinkably to the legibility, comprehensibility and even the beauty of this document. I cannot now imagine the exegesis without these improvements, as my previous drafts were haphazard, chaotic and slapdash.

I now await the conferral ceremony with the most eager and joyous anticipation. It will surely be a fitting conclusion to and reward for this pilgrimising, and the zenith of my existence in general. For the rest of my life I will be proud to associate myself with this process and the published exegesis, which owes so much to the tireless efforts of certain examiners for its present state. Only one thing presently troubles me; as I said, I am positively obliged to present a report upon 'obstacles' to the program, and as you have seen I have not encountered any at all.

I do not know what to do. I suppose I could always make some up for form's sake, but that would be a lie, and my soul and the soul of academia would and should recoil from such a prospect. It would go against everything scholarship was supposed to stand for to do such a thing, and so I can only reflect deeply, and finally confess that I once got a paper cut – I believe it was in 2018 – and I had to stop typing for two or three minutes while I found and applied a sticking plaster.

Tremblingly, I offer this to the Examination Committee (and the Celestial Bureaucracy in general), and lay my unworthy head on the block beside it. Strike if you must...

Bureflux, Prickle-Prickle Bureaucracy 50 YOLD 3186

(Sunday September 27 2020 Old Calendar)

Appendix B:
MY MASTER TUNING TABLE FOR THIS PROJECT

As discussed in the body of the text, for most of the tracks used in this project, I have chosen to follow the tuning suggested by Bohlen for his own interpretation of the scale he first discovered. This was elaborated with reference to a tuning standard suggested by Bohlen himself, in which the BP and 12–ET systems cross over at the frequency 82.41 Hz, which is a 12–ET E2 and Bohlen's suggestion for his A1.

As Bohlen noted, there is no especial reason for a crossover of this nature, and in fact any reference tone might be chosen for the scale at whim. Other practitioners have, as noted in Part 2, suggested other reference notes, and I departed from this system at my own whim at various stages, as noted in Part 3. This was partly done to experiment with just-intoned versions of the scale, and in other cases simply to experiment with other expressions of the scale in either just-intoned or equally tempered versions, just to see what it would sound like. Nevertheless, this was the tuning system that the majority of the music was created in, and it seems appropriate to offer it for examination, particularly in the form given here. This is a direct comparison between the frequency value of the 12–ET system as expressed in each of the 128 standard MIDI notes, with a corresponding BP note given at the closest 12–ET note. The difference between each note is then given in cents.

It will be noted that in the first octaves/tritaves of the table, the differences in cents are considerably greater than the 100 cents that constitute a 12–ET semitone. Although the Logic Pro X digital audio workstation that I used to create most of the tracks can only retune a MIDI note +/– 99 cents, in practice, this did not present a problem because I felt no need to use such low frequencies in the first place. I have furnished these values in any case, as they may be of theoretical interest. These workings are entirely my own, and no doubt there are other and perhaps better ways of doing these things. However, this method worked well enough for me in practice.

MIDI note	12–ET	Hz	BP	Hz	Difference
0	C–	8.18	C–	3.93	–1469
1	C#–	8.66	C#–	4.28	–1220
2	D–	9.18	D–	4.66	–1173
3	D#–	9.72	E–	5.07	–1127
4	E–	10.30	F–	5.52	–1079
5	F–	10.91	F#–	6.08	–1012
6	F#–	11.56	G–	6.53	–989
7	G–	12.25	H–	7.11	–942

MIDI note	12–ET	Hz	BP	Hz	Difference
8	G#–	12.98	H#–	7.73	–897
9	F–	13.75	J–	8.42	–849
10	A#–	14.57	A–	9.16	–803
11	B–	15.43	A#–	9.97	–756
12	C0	16.35	B–	10.84	–712
13	C#0	17.32	C0	11.80	–664
14	D0	18.35	C#0	12.84	–618
15	D#0	19.45	D0	13.97	–578
16	E0	20.60	E0	15.21	–525
17	F0	21.83	F0	16.55	–479
18	F#0	23.12	F#0	18.00	–433
19	G0	24.50	G0	19.59	–387
20	G#0	25.96	H0	21.32	–341
21	A0	27.50	H#0	23.20	–294
22	A#0	29.14	J0	25.25	–248
23	B0	30.87	A0	27.47	–202
24	C1	32.70	A#0	29.90	–155
25	C#1	34.65	B0	32.53	–109
26	D1	36.71	C1	35.40	–63
27	D#1	38.89	C#1	38.52	–17
28	E1	41.20	D1	41.92	30
29	F1	43.65			
30	F#1	46.25	E1	45.62	24
31	G1	49.00	F1	49.64	22
32	G#1	51.91			
33	A1	55.00	F#1	54.01	–31

MIDI note	12–ET	Hz	BP	Hz	Difference
34	A#1	58.27	G1	58.78	15
35	B1	61.74			
36	C2	65.41	H1	63.96	–38
37	C#2	69.30	H#1	69.60	30
38	D2	73.42			
39	D#2	77.78	J1	75.74	–39
40	E2	82.41	A1	82.41	0
41	F2	87.31	A#1	89.69	47
42	F#2	92.50			
43	G2	98.00	B1	97.59	–7
44	G#2	103.83	C2	106.20	39
45	A2	110.00			
46	A#2	116.54	C#2	115.56	–15
47	B2	123.47	D2	125.76	32
48	C3	130.81			
49	C#3	138.59	E2	136.86	–22
50	D3	146.83	F2	148.92	24
51	D#3	155.56			
52	E3	164.81	F#2	162.03	–29
53	F3	176.41	G2	176.34	–1
54	F#3	185.00			
55	G3	196.00	H2	191.88	–37
56	G#3	207.65	H#2	208.80	10
57	A3	220.00			
58	A#3	233.8	J2	227.22	–43
59	B3	246.94	A2	247.23	2

MIDI note	12–ET	Hz	BP	Hz	Difference
60	C4	261.63	A#2	269.07	49
61	C#4	277.18			
62	D4	293.66	B2	292.77	−5
63	D#4	311.13	C3	318.60	41
64	E4	239.63			
65	F4	349.23	C#3	346.68	−13
66	F#4	369.99	D3	375.94	27
67	G4	392.00			
68	G#4	415.30	E3	410.58	−20
69	A4	440.00	F3	446.76	7
70	A#4	466.16			
71	B4	493.88	F#3	486.09	28
72	C5	523.25	G3	529.25	19
73	C#5	554.37			
74	D5	587.33	H3	575.64	−35
75	D#5	622.25	H#3	626.40	12
76	E5	659.25			
77	F5	698.46	J3	681.66	−42
78	F#5	739.99	A3	741.69	4
79	G5	783.99			
80	G#5	830.61	A#3	807.21	−50
81	A5	880.00	B3	878.31	−3
82	A#5	932.33	C4	955.80	43
83	B5	987.77			
84	C6	1046.50	C#4	1040.04	−11
85	C#6	1108.73	D4	1131.84	36

MIDI note	12–ET	Hz	BP	Hz	Difference
86	D6	1174.66			
87	D#6	1244.51	E4	1231.74	–18
88	E6	1318.51	F4	1340.28	28
89	F6	1396.91			
90	F#6	1479.98	F#4	1458.27	–26
91	G6	1567.98	G4	1587.06	21
92	G#6	1661.22			
93	A6	1760.00	H4	1726.92	–33
94	A#6	1864.66	H#4	1879.20	14
95	B6	1975.53			
96	C7	2093.00	J4	2044.98	–40
97	C#7	2217.46	A4	2225.07	6
98	D7	2349.32			
99	D#7	2489.02	A#4	2421.63	–48
100	E7	2637.02	B4	2634.93	–1
101	F7	2793.83	C5	2867.40	45
102	F#7	2959.96			
103	G7	3135.96	C#5	3120.12	–9
104	G#7	3222.44			
105	A7	3520.00	D5	3395.52	–62
106	A#7	3729.31	E5	3695.22	–16
107	B7	3951.07	F5	4020.84	30
108	C8	4186.01			
109	C#8	4434.92	F#5	4374.81	–24
110	D8	4698.63	G5	4761.18	23
111	D#8	4978.03			

MIDI note	12–ET	Hz	BP	Hz	Difference
112	E8	5274.04	H5	5180.76	−31
113	F8	5587.65	H#5	5637.60	15
114	F#8	5919.91			
115	G8	6271.93	J5	6134.94	−38
116	G#8	6644.88	A5	6675.21	8
117	A8	7040.00			
118	A#8	7458.62	A#5	7264.89	−46
119	B8	7902.13	B5	7904.73	1
120	C9	8372.02	C6	8602.20	47
121	C#9	8869.84			
122	D9	9397.27	C#6	9360.36	−7
123	D#9	9956.06	D6	10186.56	40
124	E9	10548.03			
125	F9	11175.30	E6	11175.30	−14
126	F#9	11839.82	F6	12062.52	32
127	G9	12543.86			

Appendix C:

A PARTIAL CATALOGUE OF OUTTAKES, ERRATA ETC.

The material adduced here is supplementary to the tracks included for assessment with this exegesis. So much so, in fact, that after changing my mind multiple times, I have decided not to include them in the 'deliverables'. I was originally of the view that they were worth including to help understand the developmental trajectory of the research and the deliverables. However, on listening to them again in final editing, I am no longer convinced that they are really necessary to that purpose. I therefore offer this list as an alternative to trudging all the way through this material, with some limited remarks by way of explanation. The list only includes 'major' or otherwise significant works and not smaller studies or abortive material, there being plenty of both of these, too tedious to list.

	Date	Name	Duration	Remarks
1	28 Apr 16	Manhatta synch 280416–2	50:02	Soundtrack for two short 'city symphony' films screened in Redfern. Max/MSP sequence, acoustic/electric instruments.
2	29 Jun 16	Pujol V7 test 290616	6:04	Another attempt to create a viable Pujol prototype.
3	13 Oct 16	Goddess halfway 131016	8:34	Test of halfway point of movie soundtrack.
4	26 Oct 16	The Spectral Om Ensemble live at Electrofringe '16	29:11	Live performance at Electrofringe festival.
5	25 Nov 16	Goddess showreel 251116	6:28	Excerpts of finished soundtrack. First full sounding of Vathek mode in all 13 tonics.
6	21 Feb 17	Vathek hemiola 210217 (not rendered)	7:50	Test of newly devised Zigura (electric lyre).
7	23 May 17	BP Fbass improv 230517	2:28	Doom/sludge improvisation on fretless bass.
8	10 Sep 17	Liberal Hoax 100917	7:22	Application of BP to 'sludgecore' idiom. Turned off by my supervisor after about a minute at one of my four 'Stage One' presentations!
9	30 Sep 17	Sredni Vashtar II 300917	15:08	Non-Laramidian track with narration of short story.
10	6 Nov 17	SO EF17 cleanup mix 061117	16:13	Live performance at Electrofringe festival, 2017.
11	29 Dec 17	Bohlenbirdsplice 291217 (not rendered)	3:15	Test of songwriting via probabilistic mode imputed to birds.
12	5 Apr 18	Matti Bhavati 050418	2:11	First BP 'sacred' music created by stripping non-BP frequencies from sound file via spectral editing.
13	24 May 18	BP improv 2405187 [*sic*]	11:12	Northern Appalachian improvisation, testing modes.

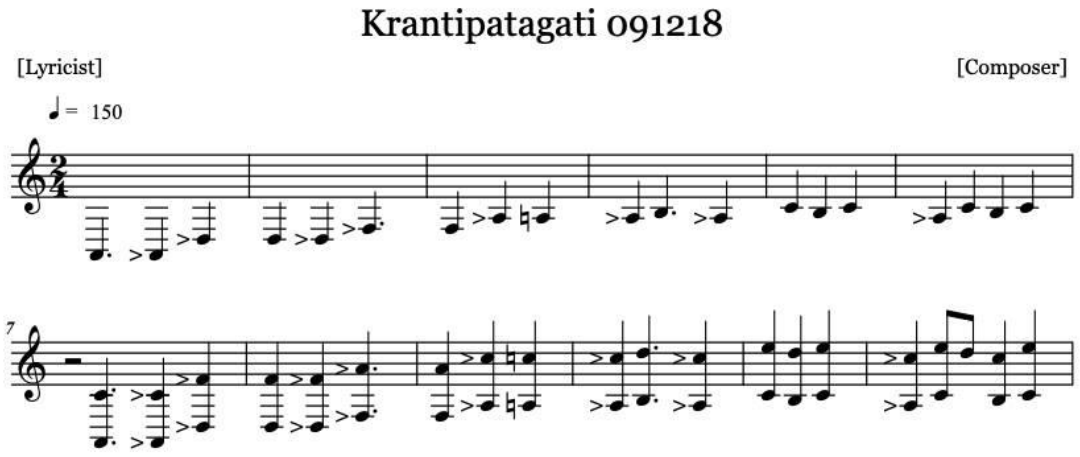
14	26 May 18	BP fakefolk 260518 300518 c1 retune.wav	1:08	South Appalachian 'folk' music.
15	11 Jun 18	SthLarFolk1 110618	1.23	'Lipyalaṃkriā'.
16	2 Jul 18	Pramanikarupa 020718	1:40	South Appalachian 'court' music.
17	26 Jun 19	Tromba 250619	2:42	Exercise in applying tromba marina to BP. Successful but not wanted for finals.

Appendix D:
'KRĀNTIPĀTAGATI'—(ALMOST) FULL SCORE

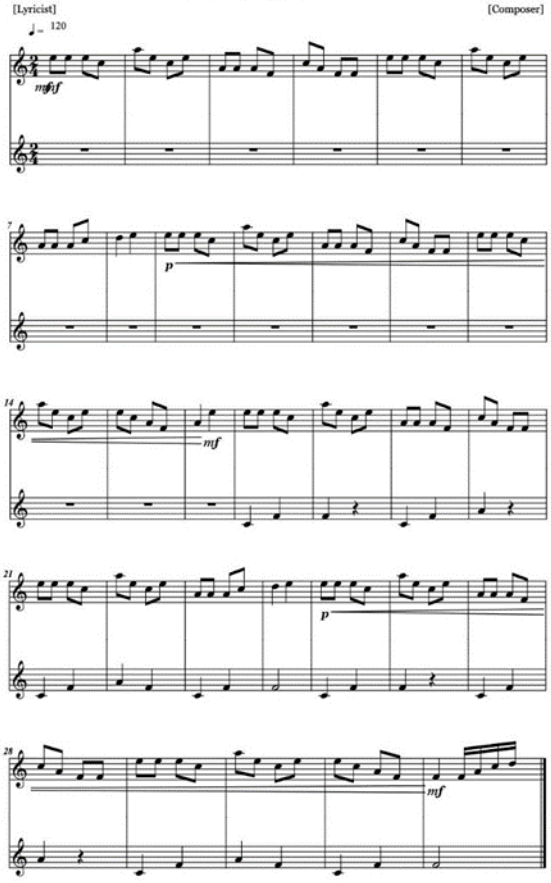
As mentioned in Section 3 (pp. 63-64), this track was mostly created using the 'Mus 2' application. This is a software package created by Turkish developers and originally intended for use with Turkish classical music. However, the software is sufficiently flexible to be used with the BP scale (and doubtless many other systems), although it of course requires some retuning and other reprogramming. One of the more interesting features of the software is that it is also capable of expressing a wide variety of notational systems that vary somewhat from common practice. I found that it was even possible to put the software into 'Op de Coul notation' (see p. 19), and for the possible interest of readers, I therefore offer this printed version of the score of this track.

A couple of caveats apply—first, percussion overdubs were applied to this track in Logic Pro X after the scored tracks had been rendered out of Mus 2, and these overdubs are obviously not notated. Second, for some unknown reason, the Mus 2 application now crashes fatally whenever I try to print a full score of the track. The notation is therefore presented in five successive parts, but of course the track was rendered and always intended to be heard as a whole. Where extra blank bars appear at the end of individual parts, these must be imagined away, with reference to the recording of the track if necessary. Third, the customised accidental marks for BP 'sharps' have not survived the passage of time; the chevrons in the score are indicative of that circumstance. Despite these imperfections, I still think the score is of sufficient interest to be worth recording in its current state.

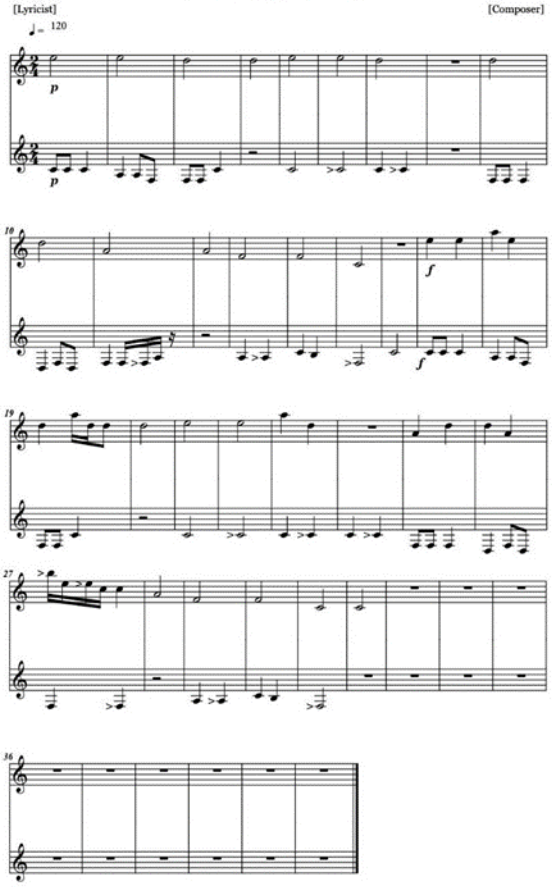
I again add the caveat that this is the only one of all of these tracks that used notation in any formal sense, and even this track did not so much demand the notation as create it as an outcome of the interface design.



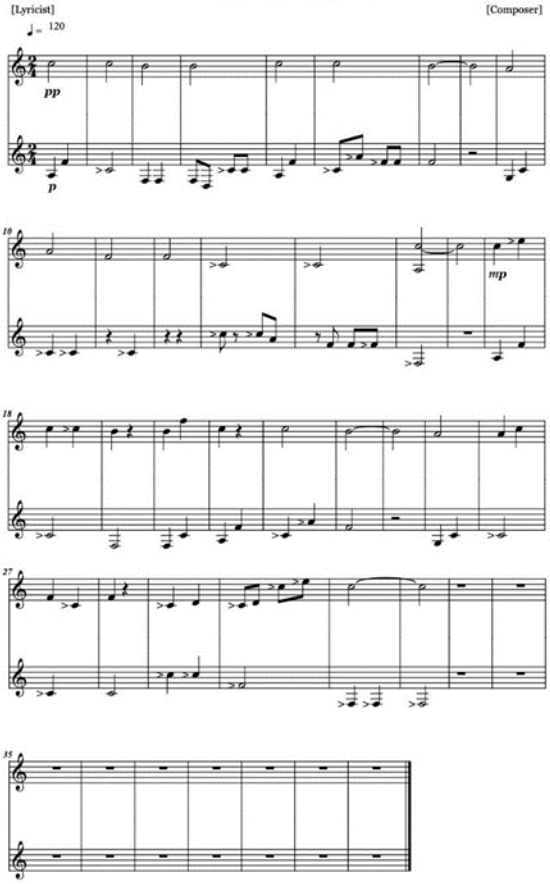
Krantipatagati 2 111218



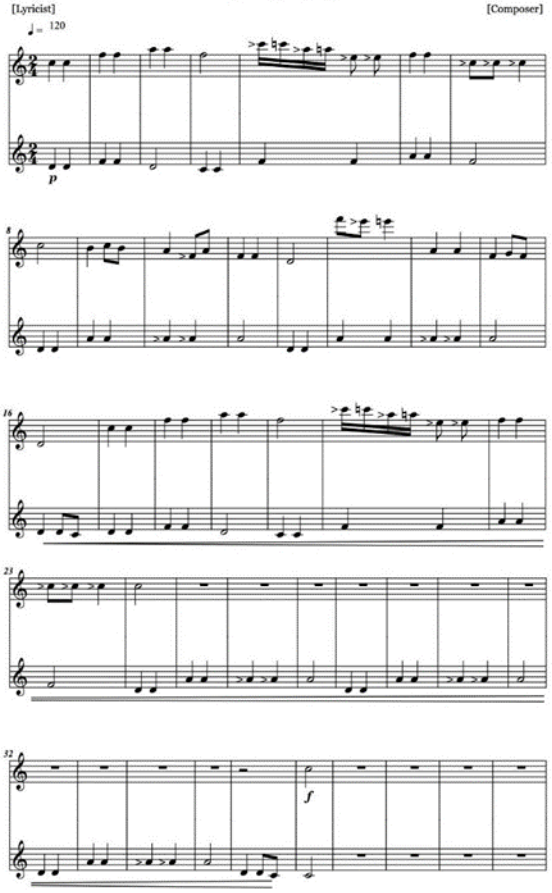
Krantipatagati 3 111218



Krantipatagati 4 131218



Krantipatagati 5 151218



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